

National Ignition Facility Quarterly Status Report— Second Quarter 2000, Jan-Mar 2000



April 30, 2000

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NATIONAL IGNITION FACILITY QUARTERLY STATUS REPORT SUMMARY MARCH 2000

Project Name:	National Ignition Facility	Building No.	581, 681 at LLNL	
NNSA Line Item No.:	96 D - 111	Project Manager:	E. I. Moses	925-423-9624 925-423-2612 (fax)
Budget & Reporting No.:	39 DP 02 (PACE) DP 0213 (OPC)	System Engineer:	M. L. Spaeth	925-424-4940 925-422-4667 (fax)
Funding Source:	Weapons Stockpile Stewardship – ICF	Program Sponsor:	C. J. Keane	301-903-4323
Original Funding Year:	'96 (first quarter)	Construction Manager:	V. S. Roberts	925-424-3662 925-423-7588 (fax)
Project Summary Description:	The Project provides for the design, procurement, construction, assembly, installation, and acceptance testing of the National Ignition Facility (NIF), an experimental inertial confinement fusion facility intended to achieve controlled thermonuclear fusion in the laboratory by imploding a small capsule containing a mixture of the hydrogen isotopes deuterium and tritium. The NIF will be constructed at the Lawrence Livermore National Laboratory (LLNL), Livermore, California as determined by the Record of Decision made on December 19, 1996, as a part of the Stockpile Stewardship and Management Programmatic Environmental Impact Statement.			
Project Justification:	The mission of the National Inertial Confinement Fusion (ICF) program is to achieve controlled thermonuclear fusion in the laboratory. This program supports the National Nuclear Security Administration (NNSA) mandate of maintaining nuclear weapons science expertise required for stewardship of the stockpile, testing of nuclear weapons effects, and the development of fusion power by providing a database for inertial fusion ignition. This mission was identified in the NIF Justification of Mission Need, which was endorsed by the Secretary of Energy. Identification of target ignition as the next important step in ICF development for both defense and nondefense applications is consistent with the earlier (1990) recommendation of NNSA's Fusion Policy Advisory Committee, and the National Academy of Sciences Inertial Fusion Review Group. In 1995, the NNSA's Inertial Confinement Fusion Advisory Committee affirmed the program's readiness for ignition experiments. A review by the JASONs in 1996 affirmed the value of the NIF for stockpile stewardship.			
Interfaces with Other Projects	The NIF is a key element of the Stockpile Stewardship Program. It will provide scientific data for secondaries and will complement hydrodynamic tests and material testing for primaries. The NIF will provide data to calibrate ASCII models. Position papers on NIF's role in Stockpile Stewardship are being prepared.			
Risk Management:	The System Engineering group has been organized and chartered to identify and manage risk. Working Groups within this organization include Beampath, Flange to Flange (cleanliness), Alignment, Contamination Control, Laser and Target Area Building (LTAB) lighting, Test Plans, Activation, and Requirements Update.			
Execution & Acquisition Strategy:	<p>The model successfully employed to execute the Conventional Facility will be adapted for the Beampath Infrastructure Systems. This model relies on the services of an Architect/Engineer (A/E) for design and an Integration Management and Installation (IMI) Contractor to assist in managing the complex interfaces during installation and the commissioning of construction contracts.</p> <p>The Acquisition Strategy for laser equipment will focus on the use of integrating contractors to the maximum extent possible to achieve the performance specifications and incorporate technology advances.</p>			

Project Manager's Second Quarter 2000 Progress Report

Summary Status

Category	Last Period	This Period	Projected Next Period
Cost	Major concern	Major concern	Major concern
Schedule	Major concern	Major concern	Major concern
Technical	Satisfactory	Satisfactory	Satisfactory
Overall Project	Major concern	Major concern	Major concern

NIF PROJECT MANAGER'S ASSESSMENT

OVERALL PROJECT ASSESSMENT

Major concern due to schedule and cost.

Safety: In January, an incident occurred at the NIF site when a worker was struck by a heating, ventilation, and air conditioning (HVAC) duct during installation. The worker received serious back injuries, but will be able to return to work in several months. An Occurrence Report was filed with the Department of Energy (DOE), and Incident Analysis and Site Management Review Teams investigated the direct and root causes of the accident and made recommendations to the Project Manager. One major recommendation was to obtain the services of a major industrial firm with an excellent safety record to review the accident and make recommendations. DuPont was contracted and spent a week at the site. Their recommendations and final report are scheduled for the end of April.

Two additional safety incidents occurred in March. One of these incidents, occurring in the CSP-6/10 package, prompted a stand down of work of all contracts associated with the Subcontractor (CSP-04, CSP-

05, and CSP-6/10) to refocus on safety communications and procedures.

Technical Status: The general status of the technologies underlying the NIF Project remains satisfactory. The issues currently being addressed are (1) cleanliness for installation, assembly, and activation of the laser system by Systems Engineering working groups; (2) laser glass, where a second pilot run at both commercial suppliers is expected to confirm the mitigation steps identified in the first pilot run; and (3) operational costs associated with Final Optics Assembly (FOA) optics components, where methods are being developed to mitigate 3ω damage and to resolve beam rotation issues.

Schedule: The project completion schedule remains a major concern for the quarter. The Beampath Infrastructure System (BIS) design and contract for the Integration Management and Installation Contractor are on the critical schedule path. The procurement package has been reviewed with DOE Procurement and NNSA Project organizations. The DOE HQ approval is scheduled for mid-April 2000.

The construction status of the Conventional Facilities at the end of March 2000 is 86% complete.

Cost: The NIF Project Total Project Cost (TPC) is \$1.2B. The Project has obligated 76% of the TPC funds. The remaining contingency is \$17.3M. Because of schedule delays and projected increases in the design, construction management, assembly, and installation of the system infrastructure, cost growth of the TPC is anticipated and will remain a major concern until the budget rebaseline process is completed. The cost roll up for Option 1 was completed in March 2000 in anticipation of review with the Level 1 and 2 Baseline Change Control Boards (BCCBs) and in May 2000 with the Level 0 BCCB, Energy Systems Acquisition Advisory Board.

Second Quarter Rebaseline Activities

The NIF Project performed the following key actions in the second quarter to rebaseline the Project before June 1, 2000: (1) implemented and stasured the NNSA approved Rebaseline Plan; (2) defined the first deployment option, Option 1, in terms of method of accomplishment, bottom-up schedule, and cost estimate; (3) implemented and stasured weekly the Transition Period Implementation Plan; (4) implemented contract activities to bring in industry to design, fabricate, and assemble the BIS in the form of engineering and a major Integration Management and Installation sole source contract; (5) continued the major external reviews of the Project; (6) completed intermediate and final reviews of the cost and schedule rebaseline leading to a Level 1 and 2

BCCB meeting; and (7) made significant technical progress in laser glass production, laser first-article procurements, and FOA resolution.

Project Rebaseline Planning: The Rebaseline Plan lays out the integrated activities to achieve new procurement strategies to involve industrial partners in the beampath infrastructure and lays out the use of contractors to design, manufacture, and assemble laser systems using enforceable bid documents, as is currently done in the Conventional Facilities. The Rebaseline Plan was approved by the NNSA and implemented this quarter. The only activity not on schedule is the development of the second option due to the delay of DOE/NNSA guidance.

Management Organization: The organization to effectively implement the rebaseline of the NIF was announced in the first quarter. The management approach has been reviewed with several external panels and with the DOE/NNSA at the Level 1 and 2 BCCB meetings.

Schedule Rebaseline: Inputs to the bottom-up rebaseline schedule (covering 24,000 activities) for the first of two completion options have been completed and transmitted to the DOE. This schedule was presented to the Level 1 and 2 BCCBs at a joint March review.

Procurement Strategy: LLNL proposed, and the independent Beampath Structure Advisory Committee concurred, that the BIS Integration Management and Installation contract be given to an industrial firm. DOE HQ has been briefed, and approval to proceed is expected in mid-April.

Independent Reviews: (1) University of California (UC) President's Office Project Management Panel review of NIF status, management approach, and method of accomplishment was completed; (2) General Accounting Office (GAO) review of the NIF continued with individual interviews; (3) Secretary of Energy Advisory Board (SEAB) Task Group of independent industry and scientific experts to advise on NIF procurement and engineering strategies reviewed their interim report in a public conference call; (4) the NIF Council conducted Performance Review and Technology Review group meetings; (5) Science and Technology Advisor to Senator Domenici reviewed NIF status; and (5) the UC ES&H Panel reviewed recent accidents.

Second Quarter
Activities Highlights

Site and Conventional Facilities: Significant progress on the Target and Laser Buildings accounted for the increase in construction completion. Due to a safety stand down that started on March 15, 2000, all NDBI work was halted until a satisfactory corrective action plan was developed.

Laser/Optics Systems: In the master oscillator system, first-article chassis have been constructed, tested, and assembled in an integrated fashion. Tests of the fiber oscillator, double-pass amplifier, electro-optic gate, and the first fiber amplifier chassis are now being conducted.

Beam Transport System: The BIS Integration Management and Installation Services subcontractor solicitation package and approach were presented to DOE Programmatic and Procurement organizations with approval to proceed scheduled for mid-April (critical path action).

Integrated Computer Control: The test group completed testing of the Flashlight software release on schedule in January 2000 and documented the results in a test summary report. The Flashlight release was the third release of control system software and the first deployment of software for the Front-End Integrated System Test.

Optics: Most of the optical design of the FOA using a wedged lens was completed in March. The remaining tasks included detailed ghost analysis and coordination with FOA mechanical engineers to assure that the design solution does not limit access and availability.

Laser Control: To date, about 360 Xinetics actuators for the deformable mirrors (DMs) have been received and tested. They are of high quality; all but nine have passed all incoming inspection tests (98%).

Target Experimental System: During the past quarter, significant progress has occurred on the FOA with respect to engineering, ultraviolet (UV) optics damage, and optics production.

Operations Special Equipment: The integrated tests of the bottom-loading universal delivery system have completed many successful fully automated sequences consisting of docking, cover removal, and plasma electrode Pockels cell (PEPC) line-replaceable unit (LRU) insertion.

ES&H and Supporting R&D: To date, Schott has produced about 225 meter-sized glass slabs meeting all of the stringent NIF specifications in their Pilot II campaign. In addition, the glass has been produced at a rate 20 times faster than could be achieved using existing one-slab-at-a-time discontinuous melting technology.

Third Quarter Scheduled Activities

The major activities scheduled to occur in the third quarter are to (1) make presentations to the SEAB Task Force after preparing responses to the recommendations from their Interim Report, (2) complete the cost and schedule rebaseline status reviews with DOE/NNSA HQ and present to the Level 1 and 2 BCCB meeting followed by the Level 0

BCCB (ESAAB), (3) present the BIS procurement and obtain the DOE HQ Procurement organization approval to proceed, (4) award the contract for the Integration Management and Installation Contractor for the Beampath Infrastructure System, (5) complete Optics Assembly Building (OAB) facility turnover to Operations, (6) complete the PEPC automated insertion demonstration, (7) start the Hoya Pilot II glass production pilot run, (8) deliver the first laser slab from Schott, and (9) receive spatial filter tubes and end vessels from the vendor.

WBS 1.1 PROJECT OFFICE

ACTIVITIES

Project Office The major Project Office activities were to: (1) implement the rebase-line plan by preparing the rebaseline schedule and cost estimates based on the options; (2) participate in external reviews by the UC, SEAB, and GAO; (3) present options to the Level 1 and 2 BCCBs; and (4) provide weekly, monthly, and quarterly status reports.

In the rebaseline activity, Option I was selected by the DOE/NNSA as the first option to implement. The first major action was to develop the procurement methodology strategy for the Beampath Infrastructure Systems (see WBS 1.4) and to prepare the rebaseline schedule and cost estimate for that option. The other options selected by the DOE/NNSA in their March 9 letter¹ will be developed from that bottom-up estimate. The rebaseline schedule was developed and submitted to the NNSA in March 2000. The schedule formed the basis for the Option 1 bottom-up cost estimate (based on 24,000 activities), which was completed later that month.

Several external reviews occurred in the second quarter: (1) UC President's Office Project Management Panel review occurred, (2) GAO review of the NIF continued with individual interviews; (3) SEAB Task Group of independent industry and scientific experts to advise on NIF procurement and engineering strategies reviewed their interim report in a public conference call; (4) the NIF Council conducted Performance Review and Technology Review group meetings; and (5) the UC ES&H Panel reviewed recent construction site accidents.

Assurances An accident occurred at the NIF site in January when a worker was struck by a HVAC duct during installation. The worker received serious back injuries but will be able to return to work in several months. An Occurrence Report was filed with the DOE, and Incident Analysis and Site Management Review Teams investigated the direct and root causes of the accident and made recommendations. One major recommendation was to obtain the services of a major industrial firm with an excellent safety record to review the accident and make recommendations. DuPont was contracted through the ICF/NIF Operations Manager and spent a week at the site. During this time, two accidents were

1. Letter T. Giaconda to C. B. Tarter, "Options for National Ignition Facility," March 9, 2000.

experienced by NDBI and its subcontractors (see WBS 1.2). This led to a safety stand down while major corrective actions were performed.

System Integration

A significant portion of the effort in System Engineering this quarter was toward rebaselining the cost, schedule, and scope of the NIF Project. The project scope and proposed items that needed to be included as part of the baseline plan because of their importance to successfully completing the NIF were reviewed. System Engineering also worked with the Functional System Description (FSD) Managers to help them understand the expectations for their role in completing the engineering and commissioning NIF Steps. The Change Control Board (CCB) Level 4 evaluated the scope change proposals and making decisions regarding those to be baselined.

Information Systems

A new web-based Engineering Change Order (ECO) form was rolled-out for the NIF project. This form has several advantages—it walks the person through all mandatory fields, thereby increasing the quality and completeness of the document, it has a provision to be corrected after approval, and it provides additional information on the disposition of material.

As an alternative to Structural Dynamics Research Corporation's (SDRC's) Metaphase product to replace Sherpa, an alternative product is being investigated (see Problems/Impacts/Corrective Actions).

The NIF Problem Identification and Correction System is the software system that supports the implementation of NIF Project Procedures 1.8, Action Tracking, and 3.2, Nonconformance Reporting. The Problem Reporting components of the system have progressed through several of development and test iterations. Final prerelease testing is planned to be complete at the end of April by a small set of 20 users. As confidence grows in the correct operation of the system, additional users will be added, and the beta designation will be upgraded to production release.

System Performance, Mission, and Risk Analysis

A plan was outlined (Performance Bundle Plan) for the performance optimization of a NIF Beamline (power and energy) after the initial commissioning is complete. The resources and schedule for accomplishing this plan were developed and included in the new baseline.

The status and goals of the NIF modeling efforts were presented to the NIF Council for their review and comment.

The effort to revalidate the NIF laser performance baseline began in earnest this quarter. It took on two tacks, controlling the configuration

of the analysis software and input parameters and examining in detail the performance of the laser. The NIF laser performance analysis began with the Injection Laser System (ILS). The impact of ILS optics quality on contrast ratio and focal spot size of the main laser was modeled.

The next effort is to identify ILS optics and optics locations that are particularly large contributors to degradation in laser quality. This information will be used to provide or modify optics specifications to the ILS procurement review.

FSD Integration

Early in this quarter the FSD Integration Group refined an FSD for the NIF. The FSD represents all of the NIF in a functional hierarchy. This hierarchy allows the elements at all levels to form operational units that can completely be described, starting with requirements through test plans. The Project is using this structure to organize the budgets and work so that each FSD organization can be responsible from requirement definition and design through to testing.

The FSD Group has also worked quite extensively to ensure that the requirements and technical information that form the basis of the Beampath Infrastructure design are correct. The information contained in the draft system definition documents was incorporated into the Process and Instrumentation Drawings (P&IDs) that are being delivered to Parsons.

Another significant verification activity has been to coordinate and develop simple computer-aided design (CAD) model representations of the Special Equipment LRUs, including the interface points. These representations are used for defining how the utilities (interface control) will be attached. In addition, extensive effort has continued to pin down the requirements and operational modes of the beampath utilities.

The FSD organization has started to shift its attention from the utility reverification effort to the line-replaceable equipment requirement development and updating. This effort has initially focused on the laser transport in the switchyard and the FOA, primarily due to the attention being paid to the redesign of these areas and the need for timely updated information.

System Alignment

The NIF Alignment 3-mm Survey Shoot was completed in February and March. The objective was to obtain a snapshot of the survey monuments used to place beampath infrastructure. There are over 900 monuments in the laser bays, switchyards, and target bays. The goal was to obtain a calculated uncertainty of $<3 \text{ mm } 3\sigma$ (gives a 97% like-

likelihood that the monument in is within the 3-mm radius. The network has closed to well within the advertised 3mm 3σ error levels.

To further increase the accuracy of the location of the survey monuments, the building needs to be thermally stable. To verify this, air and surface temperature monitors have been installed in the LTAB.

To provide and verify coordinates needed for placement of vessels and structures in the CSP packages, a tool is being developed that operates on the 3-D CAD models. This tool automatically extracts and verifies coordinates from the mechanical design models.

Contamination Control

A Contamination Control (CC) Advisory Board was established to interface with FSD Managers to establish CC Policy. The board also identified scope that needed to be added to the NIF baseline to ensure that the cleanliness requirements were met.

A Cleaning Methodology Decision Tree was developed that describes the logical decisions necessary to prepare a Statement of Work (SOW). Precision cleaning is considerably more complex than conventional cleaning following mechanical fabrication. The decision tree addresses issues such as material selection, achieving visible cleanliness, achieving precision cleanliness, passivation of stainless-steel components, and special packaging instructions.

Methodologies and tools for cleaning the Beamline in-situ are being developed. In conjunction with many of the LRU transport and handling design engineers, a design concept for a cleaning kit that includes tools to open and enter the beamline in a clean fashion was developed. A cleaning tool that has recently been identified is a sticky roller. These rollers are being tested for effectiveness in removing particles as well as residual nonvolatile residue (NVR). Another cleaning method involves a cleaning and protecting film from an industrial partner.

Fast and effective cleaning verification tools continue to be sought. The acquisition of the Optically Stimulated Electron Emission instrument that NASA Langley has developed for measuring NVR on structural surfaces is actively being pursued.

The possibility that initial substrate contamination or subsurface (polishing) defects are the prime initiator of slab damage is being investigated. This study is looking at initial contamination on samples of polished laser amplifier glass (slab glass) prior to exposure to flashlamp light using atomic force microscopy. The glass is then exposed to various levels of flashlamp illumination and reexamined

for atomic-level changes in the surface. So far, one set was exposed to 100 shots, and a 1000 shot exposure is under way.

Configuration
Management, Change
Control Actions

There was significant activity within the CCBs in support of the rebaselining activity. The CCB4 initiated twice-weekly standing meetings to review Engineering Change Requests (ECRs) and Contingency Transfer Requests (CTRs).

The following tables list the formal actions completed by the Level 4 and Level 3 Change Control Boards during this quarter.

Level 4 Change Control Board Actions:

ECR	Title	Resolution	Cost (\$K)
750	LM4-LM8 Mirror System–OC Rev	Approved	0
1316	PAMMA Utilities under CSP-9	Approved	25.0
1345	Simplify Format of NIF Planning System (NPS) Codes for FSD Elements	Approved	0
1346	Change WBS in 2.9.x and 3.1.x	Approved	0
1354	Misc Updates to FSD, from Rev A to Rev B	Approved	0
1356	ECR for ISDF Fabrication	Approved	69.3
11357	ISDF Fabrication	Approved	94.9
1408	Spatial Filter Vessel Kinematic Locator Adjustment Cam	Approved	50
1410	Add title to WBS 2.8.3.5	Approved	0
1437	Production design Changes for FOA Vacuum ISOL	Approved	100
1457	Modify 3 ω Calorimeter Chamber by Shortening	Approved	0
1474	Argon System (U400) Baseline P&IDs	Approved	170
1484	Adopt TCC Coordinate System For CSP-19	Approved	0
1485	Delete SY Jib Cranes	Approved	0
1491	REVISE WBS 2.2	Approved	0
1507	New WBS Elements For Information Sys 1.1.4.2	Approved	0
1515	LM1 Electrical Interface Cover Mod Rev C	Approved	5.7
1535	Target Bay Beamtube Opening and Embed Survey	Approved	54
1552	Compressed Air Baseline PID	Approved	0
1554	1 ω Diagnostic Beam Path Change	Approved	130
1556	Target Area Vacuum Baseline PID	Approved	0
1589	Water System Baseline PID	Approved	0

CTR	Title	Resolution	Cost (\$K)
335	Modify TRW Support	Approved	185
337	Funding for Claim Settlement with CSP-5	Approved	400
343	Funding for Field Pool for CSP-6/10	Approved	250
344	Cavity Mirror and Periscope Mounts	Approved	311
345	Reconciliation of Funding Required to Implement ECR 1282 and Perform Additional PAMMA Cleanroom Work	Approved	88
346	Independent Assessment of TAB Concrete Cracking	Approved	125
347	Implement Independent Schedule Review	Disapproved	N/A
348	Reconciliation of Funding Required to Implement BTR 74 PAMMA Cleanroom Construction and MOR Floor	Disapproved	N/A
349	Funding for Field Pool for CSP-6/10	Approved	450
350	CSP-17 Award and Field Pool	Approved	302
351	Change of Utilities and Modification of Mezzanine Steel framing to Capacitor Bay under CSP9	Approved	145
353	PABTS Breadboard Procurement Split	Approved	375

(Note: Approved items in the table above with cost impact greater than \$100K were reviewed and endorsed by CCB4 and then approved by the Project Manager.)

Level 3 Baseline Change Control Board Actions:

BCP	Title	Resolution	Date	Cost (\$k)
001	Unconverted Light Management Using Color Separation Grating	Withdrawn	1/4/00	N/A
003	FOA 3-Omega Calorimeter	Approved	1/4/00	0
004	SY Gate Valve Beam Block Capability	Approved	1/4/00	567.5
006	Change to Air Atmosphere in Amplifier Beam Enclosures	Approved	1/4/00	609
011	Clad Internal Surfaces of LM1 and Periscope	Approved	2/3/00	2600

The current contingency log is attached.

**PROBLEMS/IMPACTS/
CORRECTIVE ACTIONS**

Construction site accidents led to several corrective actions: (1) convene Incident Analysis Team for most serious accident, (2) convene Site Safety Management Review Team, (3) hire DuPont as an industrial safety consultant, (4) conduct a safety stand down of the contractor and subcontractors of concern until safety procedures and training were satisfactory (see WBS 1.2).

SDRC announced that they have purchased Sherpa, the NIF's product data management (PDM) tool. Their plan is to phase out Sherpa and transfer Sherpa customers to SDRC's PDM tool, Metaphase. There appears to be several major issues that would effect the NIF's transition to Metaphase. First, Macintosh computers are not very well supported; the latest version of their document management function is highly integrated into MS-Word, but only for Wintel platforms. Likewise, it is not clear that legacy memos generated on Macintosh platforms could be accessed and read. Second, how Metaphase is priced is significantly different than how Sherpa was priced. Sherpa provided for concurrent user licenses; Metaphase does not. Even with the 70% discounts SDRC is offering, it may cost NIF \$300K to \$400K to purchase enough seats to meet the 600 person user base. Third, the main transition tool for legacy data is a new product that was announced but will not be available until July 2000. Finally, given the significant dif-

ferences in the products, the NIF would require three to four man-years of consulting help to make a transition in a six to nine month period. In addition to the disruption of a new product, the direct cost is likely to be about \$2M.

PROCUREMENTS DuPont contract was placed through the ICF/NIF Operations Manager.

VARIANCES The rebaseline process has not been completed and, therefore, there are currently no variance statements for FY00 cost or schedule.

UPCOMING MAJOR ACTIVITIES In the third quarter, the following will be accomplished:

- Incorporate the DuPont recommendations into the Construction Safety Program.
- Resolve all issues related to the Safety Standdown for NDBI
- Issue the Integration Management and Installation contract.
- Complete the cost estimate and schedule for two selected deployment options.
- Prepare the rebaseline Project Data Sheets for each selected Option.
- Present the rebaseline cost and schedule for two options to the Level 1 and 2 BCCB.
- Provide the data for the submittal of the rebaseline cost and schedule to the Level 0 BCCB.
- The NIF 300-mm Global (survey) Network will be released in April.

WBS 1.2 SITE AND CONVENTIONAL FACILITIES

ACTIVITIES Conventional Facilities work reached 86% completion in March.

Sitework for the month of March included the placement of the remainder of both the communication and electrical duct banks and the backfilling of the vaults.

Progress in the Laser Building included the erection of masonry for the Visitors Center structure adjacent to Laser Bay 1. In Laser Bay 1, the taping of drywall continued. The temporary platform at the west end was completed, and the remaining high work was begun. Finishing of the pedestals in Laser Bay 1 continued with the water blasting, conditioning/priming, and final coats of paint. This work is about 80% complete. Structural framing for the rails of elevator 1 continued in March. In Laser Bay 2, Pentagon (the precision cleaning subcontractor) mobilized and began cleaning the return air plenums, starting at the west end. As an area was completed, it was sealed up with insulation and sheet rock to maintain the cleanliness. The underfloor return air ducts were also cleaned, and the return air dampers installed.

In the Laser Building Core Area, installation of ceramic tile continued in the restrooms and installation of the raised floor and T-bar ceiling grid was performed in the Control Room, Strategy, and Computer Rooms, including installation of seismic duct supports, underfloor sprinkler lines, conduit and wire, and light fixtures.

The installation of ductwork continued in the class 100 Preamplifier Module Maintenance Area (PAMMA) clean room. The installation of the metal pan ceiling was completed. Painting continued on the capacitor bay ceiling steel. Roll-up doors and stud framing and some sheet rock began in the OAB corridor, along with work on the HVAC system in this area.

Pipefitting and electrical work continued on the Mezzanine levels. Work continued on the air-handling units for Laser Bay 2 and PAMMA areas.

The major work in the Target Building involved the installation of the Switchyard 1 labyrinth wall segment from elevation 68.75 to 85.50 and the pour out of the Target Bay cylinder elevation 69.75 to 84.50 26' radius wall segments, 6.5' radius wall segments, and radial (spoke) walls.

The Target Building also showed progress on the -21.75 level with the installation of mechanical and fire sprinkler piping and electrical conduit; on the 17.5 elevation with the installation of pipe supports, fire sprinkler piping, and electrical conduit; and on the 50.5 elevation with the commencement of installation of piping and electrical structural supports. During this period, the HVAC chase frames were installed at the various levels throughout the structure. In addition, the installation of structural steel pipe bracing was completed, with the exception of level 69.75, which is being performed at this time. The shoring and forming for the Target Bay roof pour continued. This pour is presently scheduled for April 21, 2000.

Work in the Diagnostics Building included continuation of metal stud framing and drywall, continuation of ductwork, and electrical rough-in on elevation -33.75; continuation of metal stud framing, continuation of mechanical ductwork, and toilet room plumbing installation on -3.5 elevation; continuation of mechanical and sprinkler piping on 17.5 elevation; framing of the toilet room ceiling, continuation of electrical rough-in, piping risers, and commencement of pipe support installation on the 29.5 elevation; continuation of wood nailers, weldout of the upper duct run on elevation 50.5; and continuation of liner panel siding on the elevator shaft.

All mechanical work associated with Switchyard 2 platform at elevation 70 resumed on March 13, 2000, following the accident investigation. During the first half of the month, electrical conduit and fire protection piping installation continued on the north and west walls below elevation 70.

Due to a safety stand down that started on March 15, 2000, all CSP 6/10 work halted until March 30, 2000, when Nielsen Dillingham Builders, Inc. was given approval to restart their work.

Production work in the OAB, slowed by the safety stand down, continued with the performance of final punchlist repairs, including valve tagging, utility line labeling, and acceptance of the EVA and fire alarm systems. The Special Equipment group continued moving in materials and clean room equipment. Due to the stand down, final completion of the OAB is projected for April 2000.

PROBLEMS/IMPACTS/ CORRECTIVE ACTIONS

Safety Awareness: In January, an incident occurred at the NIF site when a worker was struck by a heating, ventilation, and air conditioning (HVAC) duct during installation. The worker received serious back injuries, but will be able to return to work in several months. An

Occurrence Report was filed with the Department of Energy (DOE), and Incident Analysis and Site Management Review Teams investigated the direct and root causes of the accident and made recommendations to the Project Manager. One major recommendation was to obtain the services of a major industrial firm with an excellent safety record to review the accident and make recommendations. DuPont was contracted and spent a week at the site. Their recommendations and final report are scheduled for the end of April.

Two additional safety incidents occurred in March. One of these incidents, occurring in the CSP-6/10 package, prompted a stand down of work of all contracts associated with the Subcontractor (CSP-04, CSP-05, and CSP-6/10) to refocus on safety communications and procedures. Additional corporate resources from Jacobs Facilities were brought in to assist in improving the safety on the project. An executive safety meeting was conducted including corporate executives and safety officers from project Subcontractors on March 23.

Congestion on the west site eased in March as most trenches were backfilled for the time being. However, the underground installation of sanitary sewer and electrical duct bank will resume in April in the Switchyard 2 area that will require close coordination between the CSP-9 and CSP-6/10 subcontractors.

The progress in the installation of Switchyard 1 steel structure under Infrastructure is slowed by the field changes that could cause certain delay to the installation of Switchyard 1 precast roof girders and associated activities with the placement of roof slab, rigid insulation, and roofing under CSP-6/10.

VARIANCES The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

- UPCOMING MAJOR ACTIVITIES**
- The Final Acceptance of OAB (Cleaned & Commissioned), CF555221, is delayed due to the safety stand down and is being negotiated with NDBI.
 - The placement of Target Bay roof slab is also delayed due to the safety stand down and is being negotiated with NDBI.
 - Diagnostic Building start-up of HVAC equipment is being negotiated with NDBI.

WBS 1.3 LASER SYSTEMS

ACTIVITIES

Optical Pulse Generation System

In the master oscillator system, first-article chassis have been constructed, tested, and assembled in an integrated fashion. Tests of the fiber oscillator, double-pass amplifier, electro-optic gate, and the first fiber amplifier chassis are now being conducted on a regular basis in the off-line, integrated system test facility. These chassis are meeting their performance specifications, with the exception of the double-pass amplifier, which has exhibited an instability. This is understood and is to be corrected in the production unit that is planned for deployment in May.

Highland Technology continues to work on the first-article amplitude modulator chassis that they are constructing; this chassis is designed to produce the required temporal pulse shapes on the NIF laser beams. Preshipment tests indicate that the rise and fall time, amplitude dynamic range, and impulse width specifications are being achieved. The timing jitter is yet to be measured. Acceptance testing of the first unit is currently in progress at LLNL, with delivery of the next three units expected in April.

Analysis of the modulation in the spectral transmission of the isolators used in the master oscillator chassis showed that the source of modulation was filters and waveplates producing etaloning effects that in turn lead to significant FM-to-AM conversion. Modifications are being made to these components by the supplier that are expected to eliminate most of this modulation.

The prototype Pre-Amplifier Module (PAM) hardware is being prepared for the upcoming front-end integrated system testing. Electronic and electro-optic modifications are being completed, diagnostics are being assembled, and interlock adjustments are being finalized. Testing with the master oscillator, input sensor package, and computer control system will begin next quarter. The latest version of control software, which will be used for this testing, was developed and released to the independent team for testing. This software includes full capability to operate the PAM control points under manual control and several master oscillator devices using embedded controllers as well as general purpose interface bus instruments.

Fault testing on the new Power Conditioning Unit (PCU) for the PAM was successfully completed at Maxwell, and the unit was delivered to

LLNL. The documentation and drawing package is being reviewed for completeness, and a procurement package is being prepared.

Amplifier Assembly

There was a great deal of progress towards preparing the B381 amplifier bus assembly area for clean assembly of the first amplifier bundle. The NIF survey group surveyed the monument system. The rails, which are duplicates of the rails that will support the amplifiers in the LTAB, were installed and aligned to the required accuracy for assembly of the FAU buses. The first production frame assembly units (FAUs) were installed on the rails, and a shakedown of the procedures for assembling and aligning the buses began. The surrogate slab cassettes that will be used to precisely align the FAUs relative to the support rails were installed in the FAU in preparation for testing the alignment process. The clean room will be recertified in preparation for assembly of the first bundle during the next quarter. The FAU bus transport and handling hardware was tested, including moving a loaded transport container with the Straddle Lifter and using the air-bearings to move the transport container in and out of B381.

Amplifier Power Conditioning System (PCS)

Design documentation deliverables in support of CSP-14 were completed during the past quarter. Design modifications to enable transportation of a fully loaded PCS module were completed and submitted to LLNL by the vendor. The bank module emulator for testing the PCS control system was completed. The emulator and embedded controller system under test operated properly during initial tests. The first PCS front-end processor (FEP) was tested and represents a complete “vertical slice” of the entire PCS controls architecture. This work represents the backbone from which the rest of the PCS control software will be based. The software requirements for controlling the gas system for the pulsed power switches in the PCS were updated.

PROBLEMS/IMPACTS/CORRECTIVE ACTIONS

The first two electro-optic phase modulators for the master oscillator system were received from JDS Uniphase and forwarded to Rifocs for attachment of fiber connectors. JDS Uniphase continues to experience problems with attaching the special polarizing (PZ) fiber to these devices, with yields under 50%. Problems occur in the cleaving, where the highly stressed PZ fiber tends to fracture, and in the bonding, where the losses increased significantly during the quality assurance temperature cycle. It was agreed to reduce the range of the temperature cycle to alleviate that part of the problem, but the very low overall yield and the incompatibility with their normal production process has seriously jeopardized future orders of modulators from JDS Uniphase.

Strategies to develop other suppliers where this specialized work is better aligned to their business is being assessed.

The first deliveries of the breadboards for the Pre-Amplifier Beam Transport System (PABTS) were not received by the end of the month as required in the contract and are projected by the vendor to be at least two months late. It was determined that the most feasible method to receive breadboards as required for CSP-13 was to descope the existing contract and solicit other vendors to pick up the balance. As a result, a new contract for one-half the initial quantity was awarded to another vendor and is proceeding without issue. Present projections are that these units will arrive in time for CSP-13.

PROCUREMENTS

The procurement package for the PAM was prepared, reviewed, and distributed to fourteen potential vendors. Three of the vendors responded within a few weeks that the procurement no longer fits into their business plan and have withdrawn from consideration. Shortly before distributing the Request for Proposal (RFP) for the PAM, it was determined that the PCU would be procured separately from the PAM. Discussions have started to develop that PCU procurement strategy and package.

Bids for the large-aperture Faraday rotators were received and evaluated on a best-value basis. The successful bidder was also the low cost bidder. The low bid was about 25% higher than the initial estimate. The contract calls for the manufacture of first-article rotators for the PAM and PABTS in FY00 at a cost of \$185K, with options for production quantities. Overall, this is a \$2.5M procurement.

Several production FAUs were received from GTC and are being used to evaluate the cleaning and assembly procedures for the amplifier hardware.

Phase III (construction of clean room and facilities) of the AstroPak precision parts cleaning contract was completed. Demonstration of the capability to reach the required particle and NVR cleanliness (Phase IV) began, including cleaning the first-article FAU. The NVR criteria were met, and the particulate criteria were nearly met. Process review is in progress to achieve adequately low particle counts on the FAUs. Phase V of the contract also began this quarter with awards to provide precision cleaning of kinematic mounts and other amplifier components.

Blastshield frames and glass were received from the vendors on schedule. The first NIF production flashlamps were received from Perkin Elmer three months ahead of schedule, and acceptance tests of these components are in progress.

Everson Electric attempted casting the first-article FAU top-plate and experienced problems with the mold design. The design was modified, and a second attempt is in progress. This contract is receiving very close scrutiny from amplifier and NIF production personnel since these components are on the critical path for FAU bus assembly.

Testing of the first-article capacitor charging supply was completed, and Maxwell Technologies (now General Atomics) was released to deliver production units. The first of those were received and are currently under test at American Control Engineering.

The first production capacitors were delivered from Maxwell Technologies (also now General Atomics) and will be tested during the next quarter. Many of the components for the PCS module that will be used for reliability and end-to-end electrical testing were ordered.

Drafts of the extensive documentation package for the PCS integration contract were completed, including the Statement of Work and component specifications. Visits to six potential vendors were completed. There appears to be a strong industry pool to provide competition for this important contract.

VARIANCES The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

- UPCOMING MAJOR ACTIVITIES**
- Expect responses to the first-article PAM RFP from potential vendors in early May.
 - Continue cost estimating, detail budget planning, development of CAPs, and overall project rebaseline planning.
 - Complete “dirty” assembly and transport of the FAU bus.
 - Commission the FAU assembly clean room.
 - Acceptance test the first production capacitors and flashlamps.
 - Activate the blastshield assembly and coating equipment in the Optics Processing Development Laboratory (OPDL).

WBS 1.4 BEAM TRANSPORT SYSTEMS

ACTIVITIES Integrated activities to achieve new procurement strategies to involve industrial partners in the BIS continued. The BIS IMI Services sub-contractor solicitation package and approach were presented to DOE Programmatic and Procurement organizations the end of February. The formal submittal of the solicitation package occurred in early March. (This activity is common to WBS 1.8 as well).

Spatial Filter Vessels/ Enclosures

Spatial Filters: Delivery of all four CSF center vessels was completed. Three of four TSFs were received. The fourth vessel was shipped from the vendor at the end of March. Fourteen of 16 spatial filter end vessels have been received. Final deliveries on the end vessels are now expected in April. Circular beam tube assembly delivery was completed with the last of the 240 pieces being received in March. Of the 192 rectangular beam tubes, 139 were on hand at quarter's end with delivery completion expected in April. The vendor has experienced some failures of the vacuum leak test due to pilot holes for ghost mitigation hardware being drilled too deep. This has required repair to a number of tubes.

Fabrication of the spatial filter connector tubes began at SynchroVac in March. They have experienced some difficulties with out-of-roundness on the initial shipment of tube stock from their supplier and are working to resolve this.

The first production unit inspection of the Tower Kinematic Mount Bellows was conducted at the fabricator (Hyspan) in late February. The unit failed due a bellows weld leak. Following corrective actions, the inspection will be repeated in April.

Laser Bay Interstage Enclosures (LBIE): A Procurement Review for the LBIEs was held in February. The RFP for the LBIEs was released on March 22, with the bids due April 14.

The performance of the LRU Interstage Docking Frame fabricator (Major Tool) increased substantially in February, largely due to a project management change on their part. Five units (of 16) had been received by the end of the quarter. Current schedule is for two clusters (8 units) to be delivered by May.

The Request for Quote (RFQ) process on the LB/SY/TB bellows assemblies first articles was initiated in February. A great deal of vendor interaction occurred during March before the vendors understood

that this was not a build-to-print contract. The vendor interaction, fabrication, and testing of these first articles is required to move the remaining bellows designs forward to meet all design and project requirements. Bids are due April 14.

Switchyard (SY) Enclosures: Yuba City Steel Products Co. satisfactorily completed the first-article inspection and testing of the SY straight enclosures in mid-February. As of the end of the quarter, 50 of the 410 pieces had been received.

Ghost Mitigation: An RFQ package for the remaining beam tube ‘megaphone-style’ ghost mitigation hardware was issued in mid-March. Installation of the spatial filter ghost mitigation towers is being considered for transfer to the CSP-16 Scope of Work from CSP-12, GFE Preparation.

Roving Mirror Diagnostic Assembly (RMDA), Optic Mounts, and Gate Valve: Initial roving mirror optic mount stability analysis results indicate that the current design may not meet optical rotational stability criteria. Model refinement is under way. In addition, these analyses are not final since the LRU (part of the Roving Mirror Assembly [RMA] system) design and properties are still immature and not modeled in detail. Detail drawings of the gate valve are expected to begin in early April. ECR 1119 requires incorporation of a beam block function into the gate valve along with remote operation capability. A plan to prototype the gate valve drive system for contamination control and performance was developed along with a qualified bidders list for the prototype.

Subassembly and Preparations of Government-Furnished Equipment (GFE): During February and March, precision cleaning and clean assembly was completed on all four CSF center vessels and seven SF end vessels. Twelve round beam tube bundles were precision cleaned in February, bringing the total cleaned to 43 (out of 240). CSP-12 pre-installation work continued on SF end vessels in preparation for precision cleaning. Work began on assembly and cleaning of the Transport Spatial Filter Center (TSFC) vessels. The first TSFC assembly was complete and undergoing precision cleaning at the end of March.

Support Structures

Laser Bay Structures: Concrete placement and painting is complete for all Laser Bay 1 & 2 concrete pedestals. The contractor and ATT Metrology surveyed embedded plate locations and found all standard, nonpenetration plates to be acceptable. However, many plates with concrete penetrations at LB2 TSF center vessel concrete pedestals were found to be out of tolerance. The thirteen worst cases of out-of-

tolerance are to be repaired by core drilling out the steel sleeve. This does not effect the construction schedule.

An ECR to clad the interior flame-sprayed surfaces of the periscope and LM1 support structures with stainless-steel sheet was presented to the Level 4 and Level 3 CCBs in mid-January. The aluminum surface is quite porous, and high-pressure washing of these surfaces continues to dislodge aluminum particles even after repeated washings. Following their approval, detailed design was begun. A formal design review was held on February 16 with no major action items generated. Vendor pre-bid qualification was conducted in parallel with Procurement. Tentative schedules and installation sequences were developed with the CSP-13 design staff to minimize schedule impacts on the installation. The RFB was issued for the contract March 22. Six vendors attended a Bidders conference at LLNL.

CSP-12 inspection of the periscope support structure PEPC frame assembly LRU openings found them to be undersized based on the current PEPC LRU design. Original openings, before cladding rework, do not provide adequate clearance between the LRU and structure. Addition of cladding, without enlarging the openings, would reduce clearances to the point of interference. This affects all 24 LRU openings in the four PEPC frames. An ECR was approved in early March. The frames were shipped to the original vendor, Martinez & Turek, who completed machining two of them by the end of March.

Process Equipment: The periscope bottom enclosure plate contractor submitted all documentation required to start fabrication. Frames have been cut and webs welded in place for the first article. The frames distorted and needed to be straightened. The first two articles will be stress relieved in April, and first-article machining will be in mid-April. This fabrication is one month behind schedule, but does not affect the construction schedule.

Hogan Manufacturing completed delivery on the ILS modifications to the preamplifier support structure (PASS) in February, on schedule.

All four units of the LM1 support structure, fabricated at Olympic Tool, have been delivered. Units 1, 2, and 3 have been accepted. Unit 4 was shipped prior to acceptance and contained many minor out-of-tolerance features. Because the nonconformances are minor, the shipping back to Olympic Tool would exceed the cost of repair, and dealing with Olympic is difficult, the structures will be repaired at LLNL. These repairs will be made prior to the structures being sent out for stainless-steel cladding. This does not effect the construction schedule.

Switchyard Structures: The main structure for SY2 has been installed. SY1 fabrication at Coast-AGRA and erection on site are continuing. Shop drawings and RFIs continue to be received from Coast-AGRA and are being processed. These RFIs continue to be incorporated into the SY1 & 2 Pro-E models that are forwarded to Parsons for use in correctly locating the utilities and equipment for the CSPs. Over 700 shop drawings were reviewed and incorporated into the models during the quarter.

Optical Mounts

Progress continued on design completion and procurement of the structure-mounted hardware, which is the interface between the structural frames/beam enclosures in the laser bays and the switchyards, target area, and optical mount LRUs.

The first production article of the LM1 Electrical Interface Panel, delivered as a precision-cleaned assembly, was received from Gregory Associates; it is being evaluated for form-fit-and-function.

The procurement package for the LM2 and LM3 kinematic mounts for CSP-16 was completed, and the request for quotation (RFQ) was released in March. (This had been delayed somewhat due to minor issues.) The bids are scheduled to close in April, with an award date in May.

The release of the LM2 and LM3 structure-mounted electrical interface panel required for CSP-16 is delayed until April (due to the late release of the LM2 and LM3 kinematic mounts previously mentioned). The scheduled delivery date for the first cluster of assemblies is 8/4/00; the required date for CSP-16 is 9/24/00. These interface panels are the connector interface between the motor controllers and the LRU stepper motors, and they are the cleanliness barrier between the beam enclosures and the laser bay atmosphere.

The LRU kinematic mount installation specification was written and submitted as part of the CSP-19 100% review package. The installation drawings, which are also part of CSP-19, are not finished; revisions are needed prior to release. A meeting was held with Engineering Services regarding CAD support for this task. Personnel have now been assigned, and weekly status meetings are being conducted. This will be completed by the end of April.

The LM7 LRU assembly models for the upper mirror bay were simplified, and the number of unique structure housing sizes was reduced from 11 to 4. Also, the LRU kinematic mount locations for LM7 were standardized. This is part of the target bay quad frame model redesign effort for the Wedged-Lens-Beam-Path-Redesign (see WBS 1.8).

**PROBLEMS/IMPACTS/
CORRECTIVE ACTIONS**

The SF end vessel fabricator (Ranor) slipped their schedule by two to three weeks in February due to poor welder performance and low staffing. The 14th vessel delivery slipped from February to mid-March. The final two vessels slipped until mid-to-late April. Conversations with the Ranor management are ongoing to prevent further schedule delays. Ranor has experienced some failures of the vacuum leak test on the last of rectangular beam tube designs due to pilot holes for ghost mitigation hardware being drilled too deeply. This has required repair to a number of tubes.

RMA interface changes continue to impact the RMDA mount design. There is a continuing concern that the evolving RMDA system design has the potential to result in interface changes due to immature LRU and delivery system design. This issue is being worked in conjunction with other CSP-19 issues. As a result, design and analysis of the RMDA mount structure continues to be delayed.

The first spatial filter end vessel showed signs of free-iron contamination after gross cleaning. The concern was that the evolution of loose rust on the interior beamline surfaces could migrate and damage optics over the life of the vessel. Consultation with LLNL and off-site corrosion experts indicated that surface contamination of stainless steel during fabrication is a frequent occurrence in shops that work with both mild steel and stainless steel. The consultants recommend that stainless-steel parts produced under these conditions have a surface acid etch, similar to that described in ASTM A380 performed prior to precision cleaning. Identification of beamline components and LRUs effected by this problem is under way to support an ECR for funding to perform the required surface treatment. The ECR is expected to be presented to the CCB in April. This was delayed due to work on the Periscope/LM1 cladding ECR.

PROCUREMENTS

A \$109K procurement was placed with Hyspan for fabrication of SF kinematic mount bellows assemblies in January.

Release for Bid packages were issued for the following items during this quarter:

- Ghost mitigation hardware for beam tubes with an estimated value of \$250K.
- Laser Bay interstage enclosures with an estimated value of \$1100K.

- Periscope and LM1 support structure stainless-steel cladding with an estimated value of \$2200K.

Optical mount procurements for structure-mounted hardware needed for CSPs are tracking consistent with or ahead of the CSP need dates.

The upper and lower kinematic interface assembly kits for laser mirror-1 (LM-1) for the first two clusters have been received from Liberty Machine. The balance of this order will be completed in April. The first cluster delivery of LM1 electrical interface panels is scheduled for April. Fabrication of the balance of this ordersremains on schedule.

Fabrication continues for the LM1 utility panels and the pneumatic mount actuators for LM1, LM2, and LM3 (being fabricated by Electrol Manufacturing Co.). Initial parts for the lower kinematic mount pneumatic actuator assembly were received and are being evaluated for surface contamination and function. These parts are being used to validate the cleaning processes and Quality Assurance (QA) used by Electrol. First-article assemblies of the mount actuator assembly and the LM1 utility panel are on schedule to be delivered in April. The delivery of the precision-cleaned pneumatic cylinders has been completed. First cluster delivery for the utility panel and lower mount assemblies for LM1 is scheduled for April. Fabrication of the balance of this order remains on schedule with completion planned for July, which is ahead of schedule for installation, by CSP-16.

VARIANCES

The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

UPCOMING MAJOR ACTIVITIES

- Continue work for completion of Title II GFE and CSP designs and place orders for most of the remaining beampath systems GFE under this WBS.
- Continue deliveries and construction of vessels, structures, and beam tubes.
- Do GFE preparation activities to complete the SF end and center vessel assembly and cleaning.
- Install SF tower support table kinematic actuators to support construction.
- Award contracts for the RFB packages issued in March.
- Release for Bid the following items in the next quarter:

- TSF extension/injection tubes with an estimated value of \$300K.
 - Laser Bay and Switchyard p-gaskets with an estimated value of \$425K.
 - Laser Bay interstage enclosure rupture panels with an estimated value of \$350K.
 - Switchyard enclosure elbows with an estimated value of \$400K.
 - Roving mirror kinematic structures with an estimated value of \$400K.
 - Laser Bay and Switchyard enclosure bellows with an estimated value of \$2750K.
- Plan to receive DOE approval to request proposal for the BIS Integration Management and Installation Services (IMI) Services Subcontract in April.
 - Plan for Jacobs submittal of IMI Services proposal in May, with negotiations and preparations to award contract through June, for an award in July.
 - Complete LM1 kinematic mounts and hardware contract for CSP-12 from Liberty Manufacturing. Receive 24 assemblies (two clusters worth) of LM1 electrical interface panels from Gregory Associates and first clusters' worth of LM1 utility panels and LM1 pneumatic actuator mounts from Electrol Manufacturing.
 - Award contract for LM2 and LM3 kinematic mount fabrication and release RFP for LM2 and LM3 electrical panels and spatial filter end vessel kinematic mount gas covers.
 - Continue transport mirror mount LRU redesign.

WBS 1.5 INTEGRATED COMPUTER CONTROL

ACTIVITIES *Software Rebaseline Size Estimate:* Approximately 1265 “effective” KSLOC (thousand source lines of code) are estimated for the complete control system. For labor-estimating purposes, the effective number includes source code written by NIF staff and 30% of additional code that is auto-generated by computer-assisted tools. To date, three formal releases of control system software amounting to 241 effective KSLOC have been placed under configuration control and put through formal testing. About 800 KSLOC are yet to be written by NIF programmers. Approximately 75% of the code is Ada95, 20% is Java (user interfaces), and 5% is C code (device drivers). This estimate was constructed by measuring the KSLOC for software components already delivered and extrapolating to account for the remaining components (e.g., there are approximately 1300 software components to be built including 250 user interfaces).

Software Rebaseline Labor Estimate: The Project rebaseline plan estimates 376 person-years of go-forward work earmarked for software requirements, coding and debugging, formal testing, documentation, commissioning, and management. This estimate was developed from a bottoms-up roll-up of the many detailed tasks. The amount of labor already expended on software requirements, design, and coding over the prior three years of the Project is approximately 75 person-years.

SAIC was commissioned to perform an independent software labor estimate of the NIF control system. Results from a COCOMO II analysis predicted that 416 person-years would be needed to deliver the remaining code. A code size smaller by one standard deviation (761 KLOC) would take 306 person-years and a code size larger by one standard deviation (1287 KLOC) would require 529 person-years. The COCOMO II analysis used the post-architecture model, which is consistent with the established software architecture and successful resolution of key risks. Within the software industry, COCOMO estimates are reported to be within 30%, about 70% of the time. This analysis roughly confirms the NIF rebaseline estimate.

Controls Testing: The test group completed testing of the Flashlight release (FEIST 1.0) in January 2000 and documented the results in a test summary report (NIF-0043959). A total of 84 test incidents were documented, including 55 software defects (65%) and 13 requirements issues (15%). The remaining test incidents were primarily attributed to the test hardware and procedures. The last two formal

tests (Flashlight and Penlight) have resulted in a defect rate of about 1 defect per KSLOC. Plans have been developed and tests initiated for the following release, FEIST 1.5. The evaluation of an automated test tool suite for future regression testing was completed in February 2000, and feedback was prepared for the tool vendors. In March 2000, the test team also completed testing for an upgrade to the software defect tracking system and initiated an effort to normalize and perform quality control for schedule activities associated with controls development and testing across the project.

Supervisory Software: Development was completed for the FEIST 1.5 release in February 2000 and continues towards the FEIST 2 Milestone, scheduled to be completed in April 2000 (see Front-End System Test status below).

The system manager framework was enhanced to condense the start-up of all programs that constitute a release into a single script; in the previous release there were 60 individual scripts. A graphical user interface (GUI) was developed to start, stop, and view the status of all processes running on the control system.

A standardized Java package hierarchy for the GUI framework was established, and a web-based Java documentation tree that allows easy navigation of the Java source code was generated.

Front-End Processor (FEP) Software: Development was completed for the FEIST 1.5 release and continues towards the FEIST 2 Milestone (see Front-End Integrated System Test status below). The Power Conditioning FEP was demonstrated with a Java GUI running test hardware and also interfaced to a bank module emulator developed by Sandia National Laboratories. The Wavefront Hartmann Sensor and Deformable Mirror FEPs were successfully demonstrated in closed-loop control for a single beam in the wavefront lab and will be deployed in April 2000. An interim release of the Special Charge-Coupled Device (CCD) Camera FEP using the FEP framework and Java-based GUIs will also be deployed in April. Development of the PEPC Plasma and Switch Pulser and Target Diagnostics FEPs are underway for interim releases in September 2000.

Optics Damage Inspection: Support for a secondary Optics Inspection system was added to the rebaseline plan, including manpower to develop software to automate data collection and analysis of ultrasonic transducer signals or video images.

Front-End Integrated System Test (FEIST): The FEIST 1.5 release was completed in February 2000 with the deployment of an integrated set of

FEPs, supervisors and framework servers into the Integrated Computer Control System (ICCS) test bed. This release added functionality to the Flashlight/FEIST 1.0 release that controls PAM devices from broad-view graphic user interfaces. This is the first release in which all operating data were stored in the Oracle database under control of framework servers. Previous releases used a mixture of database with flat files and handcrafted scripts. The FEIST 1.5 software release configuration was composed of 38 main programs, built with 152 software components.

Software development by the Supervisory and FEP teams continued to the FEIST 2 major release milestone. For FEIST 2, the Supervisory team will deliver shot capability for the PAM and the Input Sensor Package (ISP) and provide upgrades to the Message Logger, System Manager, and GUI frameworks. Shot capability will be provided by the Shot Director; Shot Setup Server; and the PAM, Laser Diagnostics, and Beam Control Shot Supervisor programs. The framework upgrades used to build Supervisory and FEP programs have been completed and deployed. Coding for Supervisory Applications for FEIST 2 is nearing completion towards an April 2000 deployment.

For FEIST 2, the FEP team made upgrades to eight FEPs included new GUI control panels for Timing, Master Oscillator, Preamplifier as well as several new devices, exception handling, and bug fixes. Motor range limit checking and stops were added to the alignment controller and new firmware was developed for the laser energy photodiode controller. Shot capture capability has been demonstrated between the Timing and Video FEPs, and a Java-based viewer are under development for the Video FEP.

Software Configuration Management: The configuration management function is responsible for delivering a complete and consistent set of control system products into both the alignment laboratory, and into the ICCS test bed, where the independent test team will validate the software. A quality control checklist that guides the post-development activities needed to deploy a software product into the computer system for test has been developed. Completion of the checklist assures that all computer software configuration items interoperate from the same database, all use the same framework services, and all are built without error diagnostics from the compiler. Each configuration item is self-identifying so that an audit trail connects each with the source code that built it, and all sources are frozen into the baseline release configuration.

The Software Change Control Board (SCCB) drafted a procedure for managing the embedded controllers that will be deployed in the facility and side labs. Embedded controller software, some developed by

NIF personnel and some purchased from a variety of sources, is constructed using tools and computers separate from the development environment. The new procedure will assure that the SCCB identifies and controls all the resources needed to preserve the embedded controllers' functionality as technology evolves during the NIF's lifetime.

Integrated Safety System: Interconnect wiring diagrams for the safety interlock system have been completed (~1000 sheets). Checking of the drawings is under way, with about 85% of the drawings having been checked.

Target Area Vacuum System: Work was begun to update the target area vacuum system control interconnect drawings (~200 sheets). The vacuum system working group is continuing to document the process interlocks for the system, which is currently about 70% complete, and expected to complete in late April 2000.

Beamline Infrastructure Controls: Work continued with Jacobs Engineering to complete the control abstracts for the tempered water, argon, amplifier cooling, and spatial filter vacuum control systems. Work was also completed with Jacobs Engineering adding the control loops to the utility system piping and instrumentation diagrams.

Industrial Controls Contract: Work started to task Jacobs Engineering with the implementation of the control systems for the spatial filter vacuum system, synthetic air cooling system, argon system, tempered water system, target area vacuum system, and the final optic assembly cooling system.

System Engineering: Updating of software requirement specifications to incorporate the latest information is in progress. The level of detail in these documents is greatly improved, providing 3 to 5 times more definition for code development and test procedures. Approximately 80% of the FEP specifications have been redrafted or are in progress. Requirements rebaseline for the FEPs is expected to be completed by July 2000. Revision of supervisor software requirement specifications will begin late in the second quarter. Requirements are being linked to the appropriate FSD elements to provide a mechanism for documenting and managing customer requirements and inputs.

**PROBLEMS/IMPACTS/
CORRECTIVE ACTIONS**

As a consequence of the rebaseline planning, additional engineering staff requirements starting the second half of FY00 have been revised upward by nine engineers to work on supervisor software, FEP software, optics damage inspection, and industrial controls engineering.

Concerns raised in February regarding optics damage inspection staffing for image analysis and detection algorithm development have been resolved.

PROCUREMENTS

Timing measurement system: Timing Solutions Corporation delivered the \$400K master timing transmitter and measurement system in March 2000.

Timing delay generators: A procurement strategy for delay generators was reached with the vendor, Highland Technology, that calls for production to be divided into four phases over the next four years, with funding for each phase committed in the year of purchase. A contract for the first 21 (of 170) delay generators was awarded March 2000. The initial contract also included nonrecurring engineering charges and the entire lot of critical parts needed for full NIF deployment. Testing continued on-site of the first four delay generators. Two units met specifications, one unit had a minor problem and was returned to the manufacturer, and the other delay generator is being tested.

VARIANCES

The rebaseline process has not been completed, and therefore, there are currently no variance statements for cost or schedule.

Release of the FEIST 2 software by the development team to the test team will slip by two weeks from April 14, 2000 to April 28, 2000 in order to complete integration and quality checks on the release configuration.

UPCOMING MAJOR ACTIVITIES

- Formal tests of FEIST 1.5 minor release of the preamplifier integrated system test software will be completed in April 2000.
- FEIST 2 major release is nearing completion and is scheduled for integration testing and configuration control April 2000.
- Final submission to Parsons of the industrial controls interconnect diagrams (~1500 sheets) is expected in early May 2000.
- A 100% design review on the fiducial timing system is scheduled for early May 2000.
- Formal testing of FEIST 2 software is scheduled for completion in early June 2000. After tests are completed, a software quality surveillance will be conducted by a team from the Software Technology Center. The surveillance report is expected July 2000.

WBS 1.6 OPTICAL COMPONENTS

ACTIVITIES

KDP and DKDP Crystals

Cleveland Crystals, Inc. (CCI) planted enough additional conventional growth deuterated potassium dihydrogen phosphate (DKDP) seeds during 2QFY00 to bring the total from 50% to 92% of those required to produce 100 NIF third-harmonic generation (THG) crystals. Four rapid growth KDP runs were completed at LLNL and vendor locations, which have a potential yield of 33 single-harmonic generation (SHG) crystals. An LLNL boule reached a record 318 kg, with a potential yield of 14 SHG crystals. The total potential yield of visibly inclusion-free KDP crystals are now 91 42-cm doublers, 35 42-cm triplers, and 96 41-cm switch crystals. Under the recently signed DOE-CEA (Commissariat a L'Energie Atomique) collaboration agreement, a portion of these crystals will be provided to the CEA for use on the Laser Integration Laboratory. The plan to increase the conversion crystals from 41- to 42-cm square for improved ghost mitigation causes a reduction in projected yield of 13%.

A low-temperature DKDP rapid-growth run was completed, demonstrating the feasibility of connecting two tanks together with continuous filtration to provide a supplemental growth solution. Although the crystal did not reach a size large enough to yield a NIF crystal, samples from the boule will be used to test whether this approach can achieve the high damage threshold in production equipment that was earlier achieved in small tanks.

Optical Design

Most of the optical design of the FOA using a wedged lens was completed in March. The remaining tasks included detailed ghost analysis and coordination with FOA mechanical engineers to assure that the design solution does not limit access and availability.

FOA configuration changes in February have delayed the start of the detailed ghost modeling into early May due to schedule conflicts at the external engineering firm tasked with this analysis. LLNL personnel are beginning to work with the ghost analysis to speed the process.

The Switchyard/Target Area Configuration drawing, updated with the new mirror placements required for the wedged lens scenario, was completed and placed under configuration management (CM) in late April.

The PAM and PABTS Vacuum Relay Telescope design documentation was completed in February. Work has now begun on final documentation of the PABTS configuration, including timing and detailed component drawings. The optical model of all 16 front-end beamlines is complete. A special release of the optical modeling code, CODE V, has been issued by Optical Research Associates, which allows this model to be extended to include the main laser and subsequent optics. The construction of the integrated model for beamline 137 has begun.

**Optical Pulse
Generation and
Injection System Optics**

An award was made for the initial two units of the TSF Upper Injection System. Several current design changes are being incorporated into the requirements at the initiation of this work.

An activity to test production readiness has been defined and was initiated in February. This includes understanding the specifications, demonstrating the ability of the small optics suppliers to meet the specifications, and ensuring the ability of LLNL and the small optics suppliers to test the optics to verify that the specifications are met. This also includes demonstrating the ability to store, analyze, and transmit the data required for NIF procurement, activation, and operations.

**PROBLEMS/IMPACTS/
CORRECTIVE ACTION**

None.

PROCUREMENTS

No major procurements were made this quarter.

VARIANCES

The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

**UPCOMING MAJOR
ACTIVITIES**

- The integrated main laser model will be completed in April, with documentation completed in early May.
- The production plan for NIF small optics will be completed in April.

WBS 1.7 LASER CONTROL

ACTIVITIES NIF rebaseline planning activities have been a predominant activity during this time period. A complete accounting of all costs associated with systems when broken down by the FSD was completed.

Release of design drawings under CM continues to be a concern although all lead engineers have met all near-term deliverables for all CSP-related design reviews and procurement packages. Weekly review of status, staffing, and priorities are performed to ensure the highest priority drawings are completed on a schedule consistent with the needs of the project. The design drawing status for WBS 1.7 is 3207 drawings required, 1970 drawings are released under CM (61% completion). In addition, a large number of CSP installation drawings have been created but not yet placed under CM. The areas with the largest number of drawings remaining are the Precision Diagnostics System (PDS) and the Roving Mirror Diagnostic Assembly (RMDA).

Alignment Systems The procurement from Armstrong Technologies of the kinematic mounts for the CSF and TSF spatial filter towers (total of 216) preceded on schedule, with about 50% received at the end of the quarter. The designs for the TSF alignment and the CSF platform assemblies were completed and are in CM. Requisitions for the components to build an engineering prototype of these platform assemblies are in progress, and the design of the TSF diagnostic platform, the tower structure, and the tower test station continued. The purchase order for the first article injection telescope, one component of the TSF diagnostic platform, was placed with Zygo Corp.

Two tower carts, for loading and unloading towers from the test stand, have been fully assembled and mounted on the Tower Test Stand to evaluate functionality. Testing of a fully loaded cart is the next step. Installation of a raised floor in front of the test stand in B391, simulating conditions in the OAB, was completed.

The design of the Input Sensor Package was completed and put under CM. The engineering prototype of the package was modified to support testing of the integrated controls for the front-end laser system (FEIST). The design of the relay optics and the lower injection systems made significant progress, especially in the area of the required enclosures.

Beam Diagnostics

All PDS design resources have been directed toward creating and completing installation drawings needed for the CSP-19 100% design review. Several internal package design reviews were conducted for PDS. Space for the assembly of PDS/LODI CSP-19 GFE and table build-up and refurbishment was approved. The Nova switchyard will be used for this activity, which will start in August 2000.

The latest energy diagnostic calorimeter amplifier was tested with all three of the different calorimeters, and the operation and nominal sensitivities were verified with electrical stimuli.

FEIST 2.0 Software for power diagnostics was installed; it will be released next month. Changes included revisions to the power diagnostics maintenance GUI. This included closing all of the outstanding software change requests from the FEIST 1.5 software release.

Wavefront Control Systems

An LLNL-developed code, MPCOAT ver. 1.03, was delivered to the Laboratory for Laser Energetics (LLE) for analyzing interferometer measurements of finished and coated DM faceplates. The code was used to evaluate the first DM faceplate coated in pilot production. This analysis determined that the coated optic did not meet the gradient and PSD specifications. Nonuniformity and edge effects of the coating are the likely cause. Corrective actions are being implemented, and a second unit is scheduled to be coated in May.

A preliminary DM shipping container design was released for comment. Updates to the DM assembly procedure and to the QA traveler cards (for DMs and actuators) were released. The new Phase Shift interferometer head was received for the LLE DM interferometer. Parts were received and assembled for a preclean area to be installed at the entrance to the LLNL DM interferometer.

The wavefront control software was upgraded to the Flashlight 0.5 frameworks release, and Flashlight 0.5 development views were created for both of the wavefront FEPs.

Fourteen blocks of Xinetics actuators have been received to date. Nine blocks (about 360 actuators) have been tested. They are of high quality—all but nine have passed incoming inspection tests (98%).

**PROBLEMS/IMPACTS/
CORRECTIVE ACTIONS**

Design changes to address the beam rotation problem affect details of the optical layout in the PDS. The integrated optics module (IOM) changes cause one mirror and the IOM frame to be mounted differently. This is a relatively minor impact compared to those in other areas, but is noted nonetheless. Once the detailed optical path through

the final optics is determined, then the detailed path through the last mirror in the PDS can be established and the hardware designs finalized; some GFE required for CSP-19 is affected. The corrective action in place is to participate in the beam rotation engineering effort and to submit a change order to the CSP-19 construction contract. The changes are expected to be minor and not worth delaying CSP-19.

PROCUREMENTS

About 50% of the tower kinematic mounts (\$216K) have been received from Armstrong Technologies and have been working well.

Orders for two of the upper injection system units were placed with Zygo. Updated drawings were delivered for their review, and a kick-off meeting is planned for late April.

Deliveries and anticipated deliveries of alignment control FEPs are on schedule with no issues (\$2.2M of orders). These orders are split among four vendors: Power 10, VMIC, OMS, and Dawn. All of the input boards (136 units), output boards (136 units), motor controllers (1072 units), and power supplies (106 units) have been received. Production is underway on the VME crates (24 of the 106 units have been completed).

All procurements for pilot DMs have been placed. All DM production contracts except for the remaining actuators will be let by LLE or by WBS 1.6.3 (optics). All pilot procurements for wavefront controllers have been placed, except for interface cards (a minor procurement).

To date, about 360 Xinetics actuators for the DMs have been received and tested. They are of high quality; all but nine have passed all incoming inspection tests (98%). Issues with the discrepant parts are being worked, and some are being returned to Xinetics for appraisal. Production is on schedule.

A requisition to modify contract B503973 to acquire the additional fiber needed for the 3 ω power diagnostic in the target area was written and approved. The new fiber will take an additional two years to fabricate. In June 1999, an export control request was submitted to loan to Vavilov a fiber "launch optic" assembly. It, as yet, has not been approved. (It is being reviewed at DOD-DTRA.)

VARIANCES

The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

**UPCOMING MAJOR
ACTIVITIES**

- Continue cost estimating, detail budget planning, development of CAPs, and overall project rebaseline planning.
- Complete PDS and RMDA designs needed for the 100% CSP-19 Review (scheduled for April).
- Continue testing associated with FEIST involving the prototype input sensor.

WBS 1.8 TARGET EXPERIMENTAL SYSTEM

ACTIVITIES

Target Chamber

During this quarter, the target chamber gunite application was completed. The 16-in. borated concrete shell awaits painting. Painting of the chamber will take place in mid-April, followed by mapping and alignment. Final chamber alignment will be done after the target bay roof is on the building to account for the dead load weight.

The post-gunite leak-up rate test to verify the vacuum integrity of the chamber was completed. The rate of rise was the same as before guniting, indicating that no leak path was formed during the gunite process.

The remaining items on the chamber contract are the final mapping, alignment, and installation of spacer shims, expected to be complete in July (a one-month delay).

The jacking ring has been put in place and aligned. There is a concern that the location of the target bay center will not be know with sufficient precision at the time of chamber alignment. This may necessitate a final adjustment to the chamber next year. The jacking ring will be left in place until then.

Target Area Structures

Target Area Government Furnished Equipment (GFE) Components: Cost and schedule impacts of the wedge lens engineering change were incorporated in January, with RFB for the target area beam path GFE to begin in June and continue through September. In addition, final beam path GFE design input for CSP-15A was scheduled for delivery to Parsons in July. Schedule analysis showed both these efforts to be on the critical path for target bay beneficial occupancy. The design group worked with the procurement organization to develop procurement strategies that could shorten the fabrication schedule.

During the quarter, the target area beam path optical model has been completed and is being used to modify the mirror frame structures in the target area. Several mirror frames have been completely remodeled, and detail drawings are in the checking process. The detailed location listing of the kinematic mounts relative to the target chamber coordinate system has not been completed, and it is required in order to be 100% complete on any given mirror frame. As of the end of March, two mirror frames, representing 4 of the 48 frames, are ready to be entered into SHERPA (when the kinematic data is provided). An additional eight frames are expected to be ready for a procurement package by the

end of April. It is hoped that incremental release of the mirror frames will save several months in the overall procurement time. The horizontal beam tubes have been completed, and the procurement specification is being reviewed. The plan is to release these for bid in late April or early May. There has been progress on the retractable and removable beam tubes and on the guillotines required for the mirror LRUs.

The target area engineers and designers prepared and presented a briefing for the Jacobs constructability engineers at LLNL and at Parsons. This briefing covered the design, assembly, and installation of the beampath GFE in the target area.

Target Area Beampath and Utilities: The target area engineers and designers provided Parsons with the design information for the horizontal and vertical beam tubes that have been modified for the beam rotation fix. It was previously planned that this information would be given to Parsons as part of the July 26 deliverables package, but, by providing the preliminary data, Parsons should be able to complete the beam path assembly drawings for the CSP-15A design package early.

Information was provided to the Parsons structural designers to prepare support structures for the horizontal beam tubes and beam tube inserts that line the concrete holes between the switchyard and the target bay.

Target Chamber Service System (TCSS): The RFQ package for a “Design and Build” of the utility lift portion of the TCSS was issued to six companies in January. Four bids were received in early March. A technical review and “Best Value” selection are expected to be complete and the contract awarded in April.

The 100% design review package was issued by PaR Systems, Inc (the boom lift vendor) in February. The package has been distributed for discipline review at LLNL, and a formal Engineering Design Review is scheduled for early April.

Target Area Handling: A simplified model of the upper mirror room was completed during the quarter. Studies with this model on installation and removal of the Target Bay laser mirrors and IOMs resulted in a new concept that may eliminate the need for Davit cranes at level 50’ 6”. This concept uses commercially available articulated jib hoists for the IOMs and the inner mirror frames at the ceiling and intermediate levels. Work has begun on a similar model of the lower mirror room.

Work updating requirements for several systems within the target area continues with Parsons. During the quarter updated requirements were given on the Level 29’ 6” access door, the Plenum Plug, and the Rotunda hoist system (subsequently placed on hold during March). Following a

meeting on the conceptual design for the Plenum plug, a revised concept was incorporated. Criteria for the Davit cranes and monorails are being reviewed in light of the jib hoist concept. Level 40' hoist system criteria were modified to lengthen the rails for IOM removal.

Numerous Target Area handling deliverables were transmitted to Parsons including: (1) procurement package drawings and specification for the utility lift system, (2) utility requirements and facility piping requirements for the TCSS, (3) LLNL 3D model of the TCSS, (4) clarification of requirements and design details for the Plenum plug and its associated removal mechanism, and (5) the list of GFE for the calorimeter spool assembly installation (January 27).

Final Optics Assemblies

During the past quarter, significant progress has occurred on the FOA with respect to engineering, UV optics damage, and optics production.

In the UV damage area, an extensive study of UV damage growth has been completed, and for each of SiO₂ and DKDP, clearly identified a threshold for growth and growth-rate coefficient. For both materials, growth rate is found to be exponential but with lower threshold (5.2 J/cm²) and slower-growth rate for SiO₂ and high threshold (7 J/cm²) and faster-growth rate for DKDP. The growth-rate coefficients are being related to material mechanical properties, and hence, other materials with expected resistance to damage growth will be evaluated as well. With a good set of damage growth data in hand, a first set of data on damage mitigation is now being done. Initial results in which damage initiated spots were etched with HF acid to a depth of ten microns showed remarkable improvement. Whereas, three of three nonetched control spots showed immediate damage growth upon illumination at 8 J/cm², five of five acid-etched spots resisted growth for 1000 shots when illuminated at fluences up to 8 J/cm². A detailed campaign on damage mitigation that will include SiO₂, acid etching, plasma etching, and laser annealing is beginning. Mitigation work on DKDP will focus on water etching.

With respect to the production of frequency conversion optics, measurements show that the bulk optical damage threshold is lower for DKDP cut as a tripler than for the material cut perpendicular to the pyramid axis. Even so, the best conventional and rapid-growth tripler-cut material has scattering losses from bulk damage that are within the NIF operating requirements. Two specific defects on the surface of finished DKDP that were located with laser-induced luminescence have been correlated with the subsequent laser-induced damage. This confirms an earlier global correlation. If all or most of the defects that lower the surface damage threshold can be located by luminescence,

they can be characterized structurally and chemically, and steps can be taken in the finishing and handling of the slabs to eliminate them.

A 41-cm z-cut KDP crystal was run successfully through the baseline NIF crystal cleaning, 1-week thermal anneal, and coating processes using the NIF equipment. Surface dehydration of KDP crystals confirmed by both FT-IR and XPS surface analytical techniques on crystals held for one to four weeks at 160°C suggests that a longer anneal should provide more robust protection against etch pits.

Tripler-etch pit mitigation efforts continue to focus on development of robust HMDS-treated sol synthesis and on diluent solvent selection to simultaneously meet NIF coating thickness uniformity and repeatability specifications. Evaluation of a matrix of polar-nonpolar and high-low evaporation rate solvents demonstrated that decane can eliminate dewetting and nonuniformity issues observed with other solvents. A model incorporating the geometry and process parameters of the NIF spin coater agrees well with experimental data for average coating thickness as a function of sol concentration, solvent, and spin conditions. Development will continue until the NIF coating specifications can be met with HMDS-treated sol.

The efforts on FOA engineering have focused on both completing the “conventional” hardware and advancing the design upgrades to more effectively handle the UV fluence.

First-article vacuum isolation valve testing continued throughout the quarter. The final long-duration cycle test was initiated at the end of March. It is expected the valve will be shipped to LLNL at the completion of this test.

A great deal of work has gone into rewriting the design requirements for the FOA. The new requirements capture the direction specified by the NIF council and incorporate the latest knowledge of UV damage and the expected optics exchange rates.

Progress was made on the top-level conceptual design upgrade of the FOA. At this time, the concept consists the vacuum isolation valve, calorimeter chamber, disposable debris shield spool, and four integrated optics modules. The primary concern has been with personnel access to the optics within the FOA and the space required for FOA maintenance.

A commitment has been made to a disposable debris shield that will be deployed in front of the main shield as an inexpensive optic that can be routinely changed. Preliminary concepts for the disposable debris shield system and an exchange mechanism for the focus lens and crystals have been developed. The concepts are being taken to a level ready for conceptual design review.

The calorimeter chamber design was modified to make room for the disposable debris shield mechanisms. The fabrication of the first-article chamber was delayed to incorporate the changes to the chamber design. The production schedule for the calorimeter chambers should not be adversely affected by this change.

Balance of WBS 1.8

The design of the first-wall panels, WBS 1.8.1.2, has been completed. Detailed design of the first-wall flashing is almost complete. The installation of the panels is being validated using the Pro-E modeling software to insure proper spacing of the panels. The first-wall panel model assembly is being verified, and any discrepancies or overlaps are being fixed. The first wall drawings are complete except for the overall assembly drawing and the installation fixture. Work was done with the target chamber service system personnel concerning the access port interface. First-wall protection for the access port was designed as was the protection for the plenum cover. The Title II 100% design review was successfully presented. The Subsystem Design Requirement (SSDR) was updated to remove all TBD entries. A prototype flashing assembly was built, and several recommendations to improve the design were made and have been included in the design. The cost and schedule for the first-wall panels have been updated.

The fabrication of the first target positioner boom was behind schedule. After the fabrication was completed, acceptance tests were performed on the boom. The boom passed its free-free vibration test but failed its static deflection test at the vendor, R³/COI. It was determined that the mounting fixture and the measurements system were the cause of the test failures. As such, LLNL has agreed that the boom passed the acceptance test.

The performance testing of the prototype Diagnostic Instrument Manipulator (DIM) was finished. Since the prototype DIM is only half-length, a complete test of all DIM performance requirements was not possible. Tests included positioning accuracy, repeatability, and temperature stability. The mechanical detail drawings for the DIM are nearly complete. The electrical design is coming along well, and detail drawings are being made. Some changes are being made to the design as the overall design is reviewed. The Title II 100% design review for the DIM was successfully presented in March. Comments have been received and are being addressed, and the SSDR was updated.

The construction of the classified control room is progressing. In the classified control room the raised floor, sprinklers, air handlers, and ceiling T-rails with overhead lights have been installed, and the room is painted. The home run conduits and cable pull can that were

installed in this room near the ceiling below the 28-ft level have not been sprayed with fire proofing spray as agreed for security. This has been deferred to CSP-14 when the laser bay utility pipes will be installed through the classified control room.

A new draft defining the design of a NIF diagnostic controller has been finished and is being reviewed. The software for the diagnostic front-end controller has been started with the goal of having a first version by August. The software for the diagnostic controller has also been started.

**PROBLEMS/IMPACTS/
CORRECTIVE ACTIONS**

Beam rotation issues continue to impact schedule and design completion costs. A baseline plan change covering the cost for completion of the beam tube and structures redesign was incorporated in early March. Retention of the knowledgeable ProSource designers, who have been relocated off-site, may be a potential problem in the future. During part of the quarter, the Target Area Structure and Enclosures group was below the level of designer manpower needed to complete the redesign by August during part of the quarter. Additional designers have been assigned.

The egress problem from the diagnostic mezzanines at the 7'10" level has a solution that has very little impact to the project. By reclassifying these spaces from mezzanines to rooms, because they are closed in and isolated from the switchyards, the occupancy can be raised from three people for a mezzanine to ten people based on 100-sq. ft. per person in a room. The longest distance in the room to a two-hour rated horizontal exit has to be less than 100 feet. This condition can be fixed by changing the west wall of the mezzanine to a two-hour rated wall and adding a two-hour wall across the vestibule from the mezzanine to the west switchyard wall. This new wall will enclose these vestibules and isolate them from the switchyards to create a two-hour rated space to exit through to the diagnostics building. The east exit with the ladder down to the switchyard steel can remain as is with no changes, and it is classified as an auxiliary exit.

PROCUREMENTS

The delivery date for the target positioner boom has been delayed to April 10. Procurement requisitions for the support structures, gimbal parts, and vacuum vessels have been signed off and sent out during March. Procurement actions for the tilt and roll mechanism and for a prototype of the ball screw support mechanism have been initiated.

VARIANCES The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

**UPCOMING MAJOR
ACTIVITIES**

- Paint, map, and align the Target Chamber.
- Redesign the Target Building GFE beam tubes and mirror frames as required for the beam rotation solution.
- Release for Bid the mirror frame packages for 4 of 24 designs in April.
- Complete the RFB of all mirror frames by mid-July.
- Work with Procurement for initial procurements and continue to develop means to reduce schedule impacts of beam rotation redesign on fabrication and delivery of other Target Area beampath hardware.
- Award TCSS utility lift design/fabrication contract.
- Review vendor's (PaR) boom lift 100% design package and authorize start of fabrication.
- Continue work with Parsons on Target Bay beampath and handling design issues for CSP15A and 15B design packages.
- Continue the design work for completion of Title II designs for the target positioner, the first-wall panels, the DIM, and the target diagnostic data acquisition system.
- Start procurement of parts for the first-article DIM.
- Finish the rebaselining activities.
- Develop the software for the diagnostic FEP and controller.
- Start the assembly of the first target positioner in the basement of B391 along with the fabrication of the second boom assembly.
- Begin a major activity to evaluate mitigation of fused silica UV optical damage by use of acid etching, plasma etching, and laser (CO₂ and UV) annealing. A campaign to understand the remaining contributors to initiation of damage at 10 J/cm² has begun in order to reduce initiators by two orders of magnitude and mitigate growth such that initiated damage can be held in check for at least 1000 shots at full NIF fluence.
- Work through a conceptual design of a disposable debris shield cassette in FOA engineering that will allow rapid and cost-effective exchange of shields on a regular basis.

WBS 1.9 OPERATIONS SPECIAL EQUIPMENT

ACTIVITIES

Optical Transport and Material Handling

Overall Assessment: The primary focus for 2Q00 has been on design/drawing completion of the delivery systems and the testing of the first-article systems. The integrated tests of the BL universal delivery system have completed many successful fully automated sequences consisting of docking, cover removal, and PEPC LRU insertion. The first fabrications and hardware for the flashlamp and amplifier slab delivery systems are being assembled and tested. Testing has been completed on the flashlamp cover seal and cover removal mechanism. The assembly of the amplifier slab cover removal mechanism has started. The contract for the second and third transporters was awarded, and fabrication of those transporters has begun by the vendor.

Bottom-Loading (BL) Delivery Systems

Universal: The spatial filter insertion system (SFIS) is complete. The SFIS test stand is assembled and installed. Wiring has been completed for the test stand, and modifications made to control the system using the computer on board the canister. The SFIS lifting fixture load test and safety note are complete and approved. The mock LRU has been assembled to use during the test program.

The airflow system fabrication is complete. The second universal canister weldment will be used to install and test the airflow system. The canister was previously used for purge testing and, therefore, is already sealed up. Prior to testing, necessary modifications will be to bring it up to the same configuration as the first weldment.

Many successful PEPC insertion sequences have been performed. These include docking the canister with the transporter, removing the beamline cover, installing the PEPC test LRU, replacing the beamline cover, and undocking the canister and then repeating to remove the PEPC LRU. The repeatability of the canister docking has been demonstrated utilizing an improved docking ball. Demonstrations of the integrated system for the PEPC group, NIF management, and several others are planned for early April.

Universal Beamline Covers: Fabrication is continuing on the covers. The perimeter seals contract has been awarded, and the first delivery is scheduled for April. An RFQ for vacuum baking and precision cleaning of the seals has been issued. LLNL capabilities and costs for performing this work are being evaluated as well.

Flashlamp: The horizontal translation mechanisms are completed and en route from THK. The carriage system fabrication is complete, and assembly will be completed in April. The cover remover prototype repeatability testing has been successfully completed. The center flashlamp cover was successfully removed and installed multiple times in succession. Leak tests were performed after each insertion to verify functionality. The cover remover system and the LRU enclosures are in fabrication. The top plate fabrication is in process.

Amplifier Slab: Completed assembly of the pneumatics system. Started assembly of the cover remover mechanism. Completed procurement of the canister compliance cylinder assemblies, FAU simulator plate, and the canister support stand. Started procurement of the LRU lifting carriage. Continued detailed design of the upper canister assembly. Started detailed design of the LRU insertion mechanism and the canister structure. Started working on the safety note for the BL canister support stand and the analysis of the canister structure.

Slab Cassette Covers: Received first articles to validate the production design for the slab cassette covers. Fabrication of machined parts for the 1st and 2nd bundles of covers is under way. The contract for cleaning and assembly of the 1st and 2nd bundles is out for quote. The production order for cover seals has been placed. Bakeout and cleaning of the seals is out for quote. The cover production order (bundles 3-24) will be sent out for quote next month. Amplifier docking receivers are in production, and the first bundle (30) has been received.

Top-Loading (TL)
Delivery Systems

Started refurbishment of the TL canister. Added seismic restraints to the LRU carriage. Replaced rod ends on the LRU carriage and cover translation mechanism. Replaced springs on the pressure relief panel. Added holes to the adapter plate to accommodate the new Laser Bay transporter orientation sensors. Ordered new gaskets to replace the existing ones made from Poron. Procured canister docking pins for use in the OAB and laser bay. Created a plan for integrated testing of the TL canister in the OAB loft. Started working on the safety note for the TL canister support stand. Completion of assembly drawings is on hold.

Thirty-nine out of 72 top loading vacuum covers have been received. Thirty-six covers have been inspected and delivered to infrastructure for cleaning and installation.

Side-Loading (SL)
Delivery Systems

Completed the detailed drawings for the SL tug. Started refurbishment of the SL skid. Replaced the control box mounting angles to accommodate increased length of the PAM. Started procurement of the SL

tug hitch and counterweights. Developed a new concept for installing input sensors. A forklift will be used to end load the input sensors using a fixture, which attaches to the top. A new concept for transporting the PCUs will use a tug similar to the SL tug to pull the PCUs, which will have wheels. Completion of assembly drawings is on hold. This system will be used as the Controls Test Platform to continue the testing of the system software updates. This delivery system will not be used on the NIF until PAMMA operations, which is scheduled for Feb 01.

Laser Bay Transporter

The fabrication of transporters #2 and #3 has begun. All long-lead items have been ordered. A meeting was held in Pittsburgh, PA with Alkab Inc. and AGV Products. Alkab, who is machining/welding the frames of the transporter, is AGV Products' subcontractor. Alkab also built the first-article frame. The two transporters will be fabricated concurrently with the first one leading the second by a couple of months. The current schedule shows transporter #2 delivered to LLNL in mid-December 2000 and transporter #3 delivered to LLNL in early February 2001. New features that will improve the transporter battery usage, increase hardware accessibility for maintenance, and enhance the transporter safety systems will be incorporated into the new transporters. There will be a design review of these new features scheduled for mid-May 2000. The new transporters are necessary to start the BL delivery systems testing with the OAB systems. It is not required to test the TL delivery system with the OAB.

Switchyard and Target Bay

The switchyard monorail and vertical specifications and drawings were completed and submitted by March 31, 2000, in support of the CSP-19 infrastructure package. Staffing is in progress to begin design effort the first of April on completing the LM4 and LM5 transport fixtures and the roving mirror transport canister.

**PROBLEMS, IMPACTS,
AND CORRECTIVE
ACTIONS**

The Transport and Handling group is running out of space for building new canisters in the B432 test facility. Space allocation drawings for the best utilization of the facility are being updated. Discussions are ongoing with other groups using the facility to determine the availability of any unused space.

Delivery of the flashlamp canister weldment has slipped into April due to a fabrication error discovered during final inspection. Special threaded inserts had to be made to correct for a bolt patten misalignment. The corrective action will not affect the design functionality.

PROCUREMENTS No major procurements were made this quarter.

VARIANCES The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

- UPCOMING MAJOR ACTIVITIES**
- New “crabbing” motors will be installed in the first-article transporter in April.
 - The universal BL canister will be used for demonstrations to senior NIF management to demonstrate docking, cover removal, and PEPC installation/removal activities. The demos will also use the Laser Bay Transporter.
 - A video will be made of the PEPC LRU and PAM LRU installation operations to be used for training.
 - The universal BL canister will be used to demonstrate a full stack up of all hardware required to install a Periscope LRU.
 - A demonstration of a SF Lens LRU insertion/removal full sequence will be performed using the Laser Bay transporter and universal BL canister this summer.
 - During the next few months, the flashlamp and amplifier slab delivery systems will continue to be assembled and tested as fabrications and hardware are received.

WBS 1.10 START-UP ACTIVITIES

ACTIVITIES Scope, schedule, and budget for this area are being reviewed, and plans will be discussed when the rebaselining exercise is completed.

WBS 1.11 ES&H AND SUPPORTING R&D

ACTIVITIES

- Assurances** The ES&H review of the ES&H impacts of using synthetic air for the NIF beam tubes and cooling systems was completed and reviewed with DOE OAK. Agreement was reached to prepare a Guidance Request Response.
- Technical Support** To date, Schott has produced about 225 meter-sized glass slabs meeting all the demanding NIF specifications in their Pilot II campaign. In addition, the glass has been produced at a rate 20 times faster than could be achieved using existing one-slab-at-a-time discontinuous melting technology. A problem encountered during the campaign forced a temporary shut down in mid-February. Repairs and modification of operating parameters are under way, and are expected to be completed in time for restart by late May. It is anticipated that Schott will complete the melting phase of their pilot II campaign by late July.
- All equipment is in place and ready for Pilot II laser glass production at Hoya Corporation USA. The final contract was completed in March to allow start-up in April. Fine-annealing studies using Pilot I glass have shown promising improvements in glass homogeneity that will be incorporated into Pilot II. Cladding production is expected to continue as planned through the early part of April; cladding yields to date exceed 90%.
- CEA representative Daniel Taroux spent the month of February with the Laser Glass Group at LLNL, primarily to work on the details of planning, coordinating, and integrating CEA-LLNL laser glass production efforts and contracts with the glass vendors. Plans were completed in March working out the details for cooperation and cost sharing in laser glass production through 2005.
- A five-year extension to the loan agreement for the use of platinum in laser glass production was signed by the Department of Defense and LLNL.
- During the second quarter of FY00, LLNL rejected the switch windows and target chamber vacuum windows for the NIF first bundle fabricated by Tinsley because they failed to meet NIF specifications for PSD2 (waviness over spatial scales 0.12-2.5 mm) and micro-roughness. Corrective actions to change and improve the robustness of the finishing process are ongoing, and a microphase measuring inter-

ferometer is being added to the Tinsley NIF Manufacturing Facility to increase in-process visibility of these two critical specifications. The Lapmaster continuous polisher is now meeting the goal of producing windows with less than one wave of transmitted wavefront error and is in use as a process step to correct the PSD2 and micro-roughness problems observed with the windows to date.

All sixteen of the LM2 mirrors to be fabricated during Pilot have now undergone final testing at Kodak. Acceptance to full NIF specifications awaits absolute calibration of normal-incidence reflected wavefront using a "round robin" optic measured by the National Institute of Standards and Technology. Kodak has also demonstrated on an AMPLAB slab the ability to use small-tool polishing to correct long-wavelength wavefront error to within NIF specifications in one iteration when the initial error is less than one wave. In early April, the results from small-tool figuring of the first full-size NIF amplifier are expected. Efforts to finish BK7 glass to a flatness of 5 waves or better on the Speedfam pad polisher have been successful and attention has now moved to demonstrating similar performance on fused silica optics.

Zygo has completed the finishing of 127 NIF optics. A number of the polarizers and amplifier slabs finished by Zygo required preferential figuring at Kodak to overcome raw material inhomogeneity. Three polarizers were completed to full NIF specifications without use of preferential figuring due to the good homogeneity glass provided by OHARA. Sufficient polarizers, LM3, LM7d, and LM8a mirrors have been shipped to meet first-bundle requirements. In addition, Zygo has completed all of the precision diagnostic mirrors for one switchyard.

The LLE has reduced coating nonuniformity by masking to less than 1%. In areas of full refinement, the nonuniformity was reduced to less than 0.1%. Spectra-Physics has resumed coating with their new control system on their coating tank. Work is proceeding with optimizing their cleaning process and training on metrology instruments which have now all been delivered. The acceptance testing of the 18-in. interferometer at Spectra-Physics was successfully completed in February.

CCI presented a preliminary design review for the crystal finishing facility in January, including modifications to the air conditioning design. A final design is expected next quarter. The design is on track to meet the requirement for facility completion by January 2001.

Crystal fabrication process development started at LLNL with the completion of the bandsaw, profiling machine, and horizontal-axis fly-cutting machine. The semi-finishing machine is expected to be ready

for process development, and the final finishing machine is expected to resume acceptance testing next quarter.

Moore Tool completed fixing nearly all of the 40 machine noncompliances on the final finishing machine that were compiled by LLNL from last quarter's acceptance tests. Moore recently reported that the French machine passed the surface roughness acceptance test, which gives us reason to expect that LLNL's machine will pass during the next tests. As a backup, upgrades to the flycutter spindle, the spindle bearings, and the flycutter are being evaluated.

The first NIF-scale sol-gel coatings using the new Chemat system were produced. The uniformity of the coating process is now approaching that of the system in the old B392 coating lab used for Beamlet and Nova.

An analysis of the performance characteristics of the baseline two-layer blastshield antireflection coating revealed a minimal benefit from the proposed silicate polymer under the sol. Consequently, the baseline blastshield coating design was changed to a single layer, ammonia-hardened sol. The sol coating is being qualified using the existing 36-flashlamp test station.

The blastshield meniscus coating system was installed and has been tested on full-sized glass panels. The average transmission of an as-deposited coating was 97.8%—nearly equal to the theoretical value of 98.2%. The ammonia curing equipment has been tested and produced densified sol films with the expected shrinkage. The urethane dispensing system (blastshield glass-metal seal) has been set up and tested. The OPDL is expected to be ready to produce blast shield assemblies by mid-April.

The 24-in. Wyko interferometers laser diode lifetime problem appears to be resolved, although it is too early to be certain. A review of the design of the laser diode package revealed sensitivity to optical feedback. This was corrected by incorporating an optical isolator after the laser diode source. Modified diode packages have been incorporated into the interferometers located at Tinsley, Kodak, and LLNL and are functioning very well. This upgrade will be incorporated into the remaining interferometers in April. In addition, a backup design approach has been pursued with Wyko utilizing a HeNe laser source. Training for the Spectra-Physics 18-in. interferometer and acceptance testing for this system is complete.

The second NIF photometer was installed at Spectra-Physics in February. Both of the coating suppliers for NIF large optics now have the

new Bauer photometer. This unit has significant capabilities as well as the ability to scan large optics. This unit can measure at three NIF laser wavelengths, at variable polarization, over a range of angles-of-incidence, and on curved surfaces.

**PROBLEMS/IMPACTS/
CORRECTIVE ACTIONS**

The fabrication and assembly contract was awarded to Tinsley as part of the effort to complete the Lens Optical Test System (LOTS). Final metrology cannot begin on lenses until the LOTS is completed and validated. Tinsley has begun reworking windows that failed the PSD II-Waviness and roughness specifications.

Zygo did not complete the first NIF amplifier slab finishing to full NIF wavefront specifications due to small-scale wavefront errors requiring small-tool figuring. Slabs were sent on to Kodak to facilitate meeting this milestone in early April.

Initial results with a new laser diode package for the Wyko 24-in. interferometers are very promising. Incorporation of an optical isolator may have resolved the diode lifetime issues.

The third (LLNL) photometer is still at Bauer to allow them to resolve operational problems uncovered with the first two units.

PROCUREMENTS

The Kodak pilot contract was modified to add ion figuring of 20 polarizer blanks to allow use of glass with marginal homogeneity.

A contract for \$240K was awarded at Tinsley for the fabrication and assembly of two LOTSSs.

A contract modification for an incremental \$461K was made at Tinsley in February to extend the pilot contract through April.

VARIANCES

The rebaseline process has not been completed, and therefore, there are currently no variance statements for FY00 cost or schedule.

**UPCOMING MAJOR
ACTIVITIES**

- The first Pilot II slab will ship from Schott to Zygo in early April.
- Hoya Corporation will begin their Pilot II campaign in April at the conclusion of their edge cladding run. The contract was completed for this work and will be awarded effective April 1.

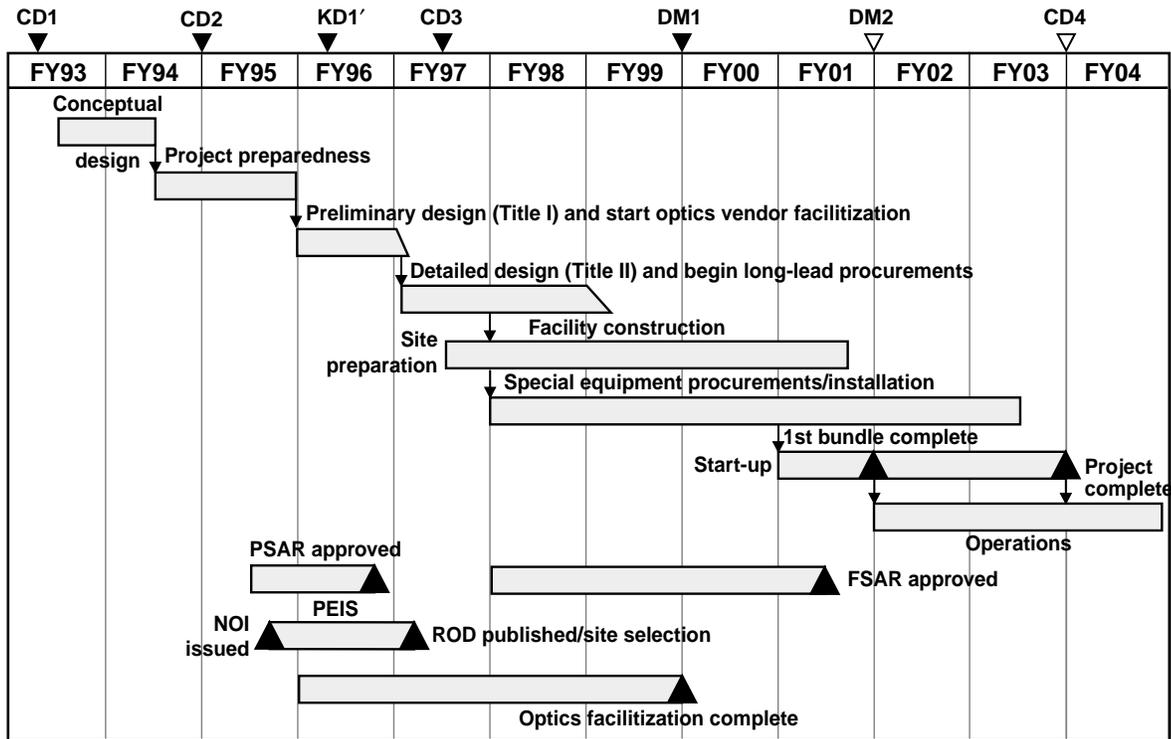
- In early April the results from small-tool figuring the first NIF amplifier at Kodak are expected.
- New diodes with optical isolation will be available for the remaining 24-in. Wyko interferometers in April and will be installed at all affected vendor sites.
- Spectra-Physics is scheduled to coat a NIF-size polarizer with the NIF process and begin metrology in April.
- Review of the NIF Final Supplemental Environmental Impact Statement will be complete.

ATTACHMENT 1: SCHEDULE STATUS

The schedule status section will provide (1) a summary schedule, (2) a status of the NIF Project Execution Plan milestones, (3) a status of the DOE performance measurement milestones, and (4) the critical path analysis.

At this point, Project schedules are being rebaselined to implement the completion options to be selected by the DOE. A bottom-up schedule for Option 1 with 24,000 individual activities, was submitted to DOE/ NNSA for approval. When the new schedules are prepared, they will be stated in the monthly report.

Summary Schedule



CD1 Approve mission need
 CD2 Approve new start
 KD1' Dillum's Process—
 NIF Study complete

CD3 Approve construction start
 CD4 Approve Project completion
 DM1 Optics Facilitization complete
 DM2 End Conventional construction

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 skl

The rebaseline schedule will result in an update to the NIF Project major milestones to reflect the completion options proposed to the DOE. Until the rebaseline schedule is available, the current baseline will be stated.

Status of NIF Project Execution Plan Milestones

Milestones	NNSA Acquisition Executive Level 0	NNSA Office of Inertial Fusion and the NIF Project Level 1	NIF NNSA Field Office Level 3	NIF Laboratory Project Office Level 3	Date Planned	Date Actual
Approval of Mission need (CD1)	X				Jan 1993	Jan 1993
CDR Complete				X	May 1994	May 1994
Approval of New Start (CD2)	X				Oct 1994	Oct 1994
Notice of Intent Issued		X			Jun 1995	Jun 1995
KD1' Dellums Process Complete	X				Dec 1995	Dec 1995
Architect/Engineer Contracted				X	Dec 1995	Dec 1995
Title I Initiated				X	Jan 1996	Jan 1996
Construction Manager Contracted				X	May 1996	May 1996
PSAR NNSA Concurrence			X		Aug 1996	Aug 1996
PSAR Approved				X	Sep 1996	Sep 1996
NEPA Record of Decision	X				Sep 1996	Dec 1996
Approval to Initiate Title II Design			X		Sep 1996	Nov 1996
Approval to Initiate Long-Lead Procurement			X		Sep 1996	Nov 1996
Approval to Initiate Construction (CD3)	X				Mar 1997	Mar 1997
Issue Pollution Prevention & Waste Minimization Plan			X		Sep 1998	Sep 1998
Optics Facilitization Complete (DM1)		X			Oct 1999	Oct 1999
Start Special Equipment Installation				X	Nov 1998	Nov 1998
Target Chamber Installed				X	Oct 2000	
LTAB Superstructure Complete				X	Dec 2000	
FSAR NNSA Concurrence			X		Feb 2001	
FSAR Approved				X	Mar 2001	
LTAB Construction Complete				X	Jul 2001	
End conventional Construction (DM2)		X			Sep 2001	
ORR/ORE Complete—Start Early Operations			X		Sep 2001	
End of Construction			X		Apr 2003	
Project Complete (CD4)	X				Oct 2003	

**STATUS OF DOE/
NNSA PERFORMANCE
MEASUREMENT
MILESTONES**

The NNSA-approved NIF Transition Period Implementation Plan contains a set of performance milestones from October 1, 1999, to June 1, 2000. These milestones are stated by NNSA on a weekly basis. The NIF Monthly Status provides the completed milestones at the end of March 2000.

NIF rebaseline schedule

NIF



The National Ignition Facility

O	N	D	J	F	M	A	M
			30% Prog. Rep. ▲	60% Prog. Rep. ▲	90% Prog. Rep. ▲	Change Control Board 2&1 meeting ▲	Change Control Board 0 meeting reports to Congress ▲
				Submit Project Data Sheet to DOE ▲			
				Complete final Option x cost roll-up ▲			
				Submit Option x schedule to DOE ▲			
		Projected date 4/07/00, Complete final Option 1a cost roll-up ▲					
			Submit Option 1a schedule to DOE ▲				
			Preliminary findings of independent cost estimator complete ▲				
			Initiate Option x planning ▲				
			Incorporate Implementation Plan into schedule ▲				
			▲ Develop BIS Implementation Plan				
			▲ Contract Independent cost evaluator				
			▲ Develop BIS procurement methodology				
		▲ Submit Rebaseline Plan					
							Status 3/31/00

3/31/00
PWSZ

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Beampath Infrastructure — A/E and CM/GC — FY00



O	N	D	J	F	M	A	M
			30% Rev ▲	60% Rev ▲	90% Rev ▲	Change Control Boards 2&1 Meeting	Change Control Board 0 Meeting
						Issue 100% review package for LB utilities	Issue 65% review package for TB utilities
						Final interconnection wiring diagrams, tables & rack layouts to Parsons	Complete final BIS utility requirements
						Projected date TBD 65% review of CSP14B (LB utilities w/o spine)	Complete final BIS utility requirements
						Projected date 4/14/00 DOE HQ approval to submit proposal	Jacobs CM/GC proposal
						▲ Award Parsons contract to complete BIS design	▲ Jacobs CM/GC package to DOE
						▲ Intent for CM/GC	▲ Award Parsons contract to complete BIS design
						Status 3/31/00	

Line Replaceable Units - FY00

NIF



The National Ignition Facility

	O	N	D	J	F	M	A	M
				30% Rev ▲	60% Rev ▲	90% Rev ▲	Change Control Boards 2&1 Meeting	Change Control Board 0 Meeting
							FAU dirty assembly test complete	Sac of Energy reports to Congress
							Receive first FAU production top plate	
							Front-end laser control system software (4th) released	
							Deformable mirror actuators, 1st article, received	
							Award contract for cleaning FAU production components	
							PAM 1st article RFP released	
							Projected date 4/21/00 Vacuum isolation valve, 1st article, received at LLNL	
							Flashlight software release tests completed	
							Master timing system factory acceptance tests completed	
							PABTS breadboards contract awarded	
							Flashlight (3rd) control system software released	
							Flashlamp contract awarded	
							Master timing system factory prototype demonstrated	
							Capacitor contract (vendor #2) awarded	
							Status 3/31/00	

△ Project Milestones
○ Program Milestones

3/31/00
mcz

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Optics — FY00

NIF



The National Ignition Facility

	N	D	J	F	M	A	M
			30% Rev ▲	60% Rev ▲	90% Rev ▲	Change Control Boards 2&1 Meeting ▲	Change Control Board 0 Meeting ▲ Sec Of Energy reports to Congress ▲
						First Schott laser slab received ▲	
						Small optics production plan ▲	
						Demo Spectra-Physics full-scale polarizer coating ▲	
						Start Hoya pilot II ▲	
						Award Tinsley Pilot bridge contract ▲	
						Ship 1st Zygo amplifier slab ▲	
						Demo 1% coating uniformity at LLE ▲	
						Update optics vendor cost studies ▲	
						Projected date 5/15/00 ▲	
						Ship first bundle vacuum and switch windows ▲	
						Ship 1st Zygo polarizer ▲	
						Award Kodak amplifier polishing ▲	
						Status 3/31/00	
						Start Schott pilot II ▲	

Target Area Systems and Target Diagnostic Systems—FY00



	N	D	J	F	M	A	M
			30% Rev ▲	60% Rev ▲	90% Rev ▲	Change Control Boards 2&1 Meeting ▲	Change Control Board 0 Meeting ▲ Sec of Energy reports to Congress
					Conduct survey spectrometer diagnostic CDR	Conduct survey spectrometer diagnostic CDR	Conduct survey spectrometer diagnostic CDR
					Conduct FABS & NBI diagnostic CDR	Issue RFQ for 1st article DIM	Conduct FABS & NBI diagnostic CDR ▲ (note: NBI moved to FY01 Due to budget reduction)
					Complete software design specification for data archival system	Complete software design specification for data archival system	Complete software design specification for data archival system
					Projected date 4/10/00 ▲ Delivery of target positioner booms (unless boom has to be completely rebuilt)	Projected date 4/10/00 ▲ Delivery of target positioner booms	Projected date 4/10/00 ▲ Delivery of target positioner booms
					Initiate procurement of 1st article DIM	Initiate procurement of 1st article DIM	Initiate procurement of 1st article DIM
					Validate cost estimate for shield doors	Validate cost estimate for shield doors	Validate cost estimate for shield doors
					Complete detailed design of target positioner	Complete detailed design of target positioner	Complete testing prototype DIM
					Field CCD diagnostic camera at OMEGA	Field CCD diagnostic camera at OMEGA	Field CCD diagnostic camera at OMEGA
					X-ray streak camera 65% design review	X-ray streak camera 65% design review	X-ray streak camera 65% design review
					DAS Title II 65% design review	DAS Title II 65% design review	DAS Title II 65% design review
							Status 3/31/00

3/31/00
ncc

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25EN/ncc

Assembly/Refurbishment Facilities – FY00

NIF



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O	N	D	J	F	M	A	M
			30% Rev ▲	60% Rev ▲	90% Rev ▲	Change Control Boards 2&1 Meeting ▲	Change Control Board 0 Meeting reports to Congress ▲
						FAU - cleanroom certified and ready for use	FAU - cleanroom certified and ready for use ▲
						OPDL - 1st bundle blast shields ready for FAU	OPDL - 1st bundle blast shields ready for FAU ▲
						OPDL - blast shield assembly equipment installed	OPDL - blast shield assembly equipment installed ▲
						Fully automated PEPC insertion demonstration	Fully automated PEPC insertion demonstration ▲
						Award transporter contracts (#2 & #3)	Award transporter contracts (#2 & #3) ▲
						FAU - dirty assembly test complete	FAU - dirty assembly test complete ▲
						Projected date 3/17/00	Projected date 3/17/00 ▲
						OAB - small precision parts cleaner installed	OAB - small precision parts cleaner installed ▲
						B391 - power module area construction complete	B391 - power module area construction complete ▲
						OAB - beneficial occupancy	OAB - beneficial occupancy ▲
						OAB - large precision parts cleaner installed	OAB - large precision parts cleaner installed ▲
						OAB - parallel occupancy begins	OAB - parallel occupancy begins ▲
						OPDL-large optic cleaning & coating equipment installed	OPDL-large optic cleaning & coating equipment installed ▲
						Status 3/31/00	Status 3/31/00

3/31/00
nce

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25EIM/nce

ATTACHMENT 2: FINANCIAL STATUS

The financial status includes (1) 2Q00 cumulative-to-date Project financial summaries by WBS Level 2 and by participant; (2) FY00 Plan to Actual Cost and Cost plus Commitments monthly for Total Project Cost, Total Estimated Cost, Other Project Cost, and each WBS Level 2 element; (3) the quarterly Contingency Log; and (4) FY00 monthly Manpower Plan to Actual.

PROJECT PLAN-TO- ACTUAL COST AND COST PLUS COMMITMENTS

FY00 NIF Cost and Cost and Commitment plans are presently shown as straight-line estimates of the current year budget allocations. FY00 CAPs are scheduled to be completed when the rebaselining process concludes.

The March 2000 WBS Level 2 variances resulting from actual versus the drafted straight-line budget plans are not individually discussed. TPC, TEC, and OPC Cost and Cost and Commitment variances ranging from 5% to 50% of actual below straight-lined plans indicate that overall FY00 costs and commitments are well within the current year funds availability. This conservatism is expected to prevail as long as rebaselining efforts are in progress.

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National Ignition Facility (NIF) - Project No. 96-D-111

Cumulative-to-Date Project Financial Summary by Participant through March 2000 (\$K)

Project Participant	Baseline Budget (a)	Planned Commitments to Date	Planned Costs to Date	Current Estimate (b)	Actual Obligations to Date (c)	Actual Commitments to Date	Actual Costs to Date
LLNL TEC	887,380	759,287	642,427	1,000,354	784,114	746,477	601,771
SNL TEC	21,536	20,229	20,146	22,156	22,308	20,443	20,434
LANL TEC	4,984	7,945	7,755	5,862	8,755	8,007	8,007
LLE TEC	-	288	288	-	390	57	40
Subtotal TEC	913,900	787,748	670,617	1,028,371	815,568	774,984	630,252
Contingency TEC	131,800	-	-	17,329	-	-	-
Total Estimated Cost (TEC)	1,045,700	787,748	670,617	1,045,700	815,568	774,984	630,252
LLNL OPC	146,480	132,471	131,587	145,822	137,607	131,694	130,218
SNL OPC	2,250	2,250	2,250	2,250	2,250	2,250	2,250
LANL OPC	1,895	1,894	1,894	1,893	1,895	1,894	1,894
LLE OPC	360	488	488	568	510	485	485
ANL OPC	2,099	2,516	2,516	2,550	2,600	2,537	2,537
NV OPC	116	117	117	117	117	117	117
Other OPC (d)	-	-	-	-	-	-	-
Other Project Cost (OPC)	153,200	139,737	138,852	153,200	144,978	138,977	137,502
LLNL TPC	1,033,860	891,758	774,014	1,146,176	921,721	878,170	731,989
SNL TPC	23,786	22,479	22,396	24,406	24,558	22,693	22,684
LANL TPC	6,879	9,840	9,650	7,755	10,550	9,902	9,902
LLE TPC	360	776	776	568	900	542	525
ANL TPC	2,099	2,516	2,516	2,550	2,600	2,537	2,537
NV TPC	116	117	117	117	117	117	117
Other TPC (d)	-	-	-	-	-	-	-
Subtotal TPC	1,067,100	927,486	809,470	1,181,571	960,546	913,961	767,754
Contingency TPC	131,800	-	-	17,329	-	-	-
Total Project Cost (TPC)	1,198,900	927,486	809,470	1,198,900	960,546	913,961	767,754

(a) Baseline Budget consistent with NIF Project Execution Plan (Appendix D) as of August 1997.

(b) A rebaselining effort is currently in progress which will revise this estimate.

(c) Actual Obligations to Date = cumulative to date NIF Project funds obligated by DOE to Contractors, consistent with actual contract modifications.

(d) Carryover WFO/DOE OPEX at OAK (\$548) is shown in the participant (LANL) OPEX balances.

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National Ignition Facility (NIF) - Project No. 96-D-111

Cumulative-to-Date Project Financial Summary by WBS Level 2 through March 2000 (\$K)

WBS Element	Approved Baseline Budget (a)	Planned Commitments to Date	Planned Costs to Date	Current Cost Estimate (b)	Actual Obligations to Date (c)	Actual Commitments to Date	Actual Costs to Date
1.1 Project Office	66,700	69,695	69,117	78,243		80,853	72,791
1.2 Site & Conventional Facilities	213,700	244,428	217,172	248,338		240,188	206,180
1.3 Laser Systems	204,500	111,119	82,786	218,666		120,629	75,195
1.4 Beam Transport System	92,000	142,959	111,909	129,549		132,494	94,993
1.5 Integrated Computer Control	21,600	15,583	14,861	20,618		14,882	14,275
1.6 Optical Components	146,500	56,299	45,190	144,494		48,362	41,751
1.7 Laser Control	72,000	36,322	31,801	75,474		37,061	32,677
1.8 Target Experimental System	68,000	75,641	64,792	82,559		69,839	62,920
1.9 Operations Special Equipment	28,900	35,701	32,988	30,429		30,675	29,468
Subtotal	913,900	787,748	670,617	1,028,371		774,984	630,252
Contingency	131,800			17,329			
Total Estimated Cost (TEC)	1,045,700	787,748	670,617	1,045,700	815,568	774,984	630,252
1.10 Start-up Activities	19,900	5,861	5,861	19,296		5,986	5,976
1.11 ES&H and Supporting R&D	133,300	133,876	132,991	133,904		132,991	131,526
Other Project Cost (OPC)	153,200	139,737	138,852	153,200	144,978	138,977	137,502
Total Project Cost (TPC)	1,198,900	927,486	809,470	1,198,900	960,546	913,961	767,754

(a) Baseline Budget consistent with NIF Project Execution Plan (Appendix D) as of August 1997.

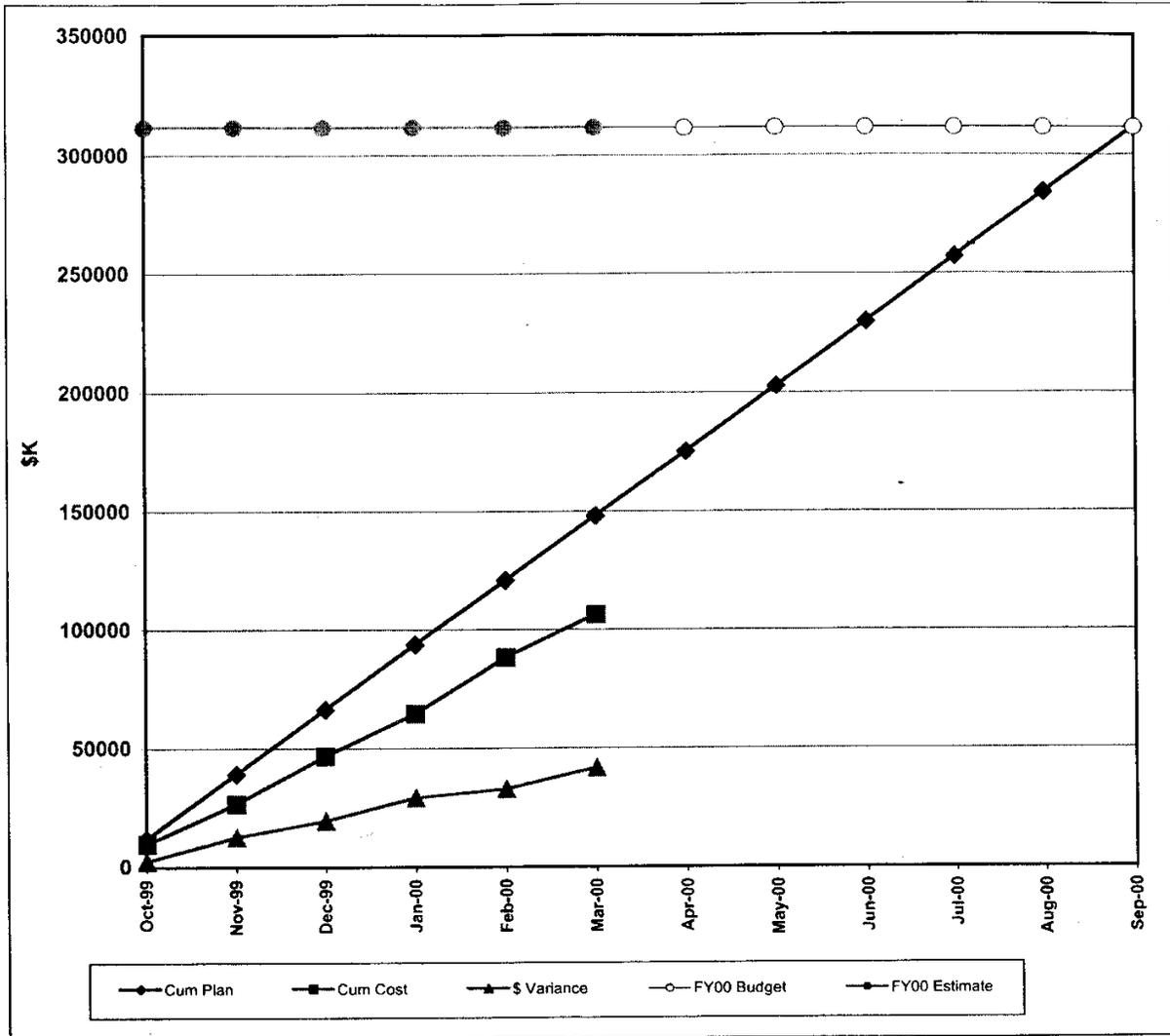
(b) A rebaselining effort is currently in progress which will revise this estimate.

(c) Actual Obligations to Date = cumulative to date NIF Project funds obligated by DOE to Contractors, consistent with actual contract modifications.

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**FY2000 Cost Plan to Actual
as of March 2000
Total Project Cost (TPC) (\$K)**

Project Number 96-D-111
March 2000



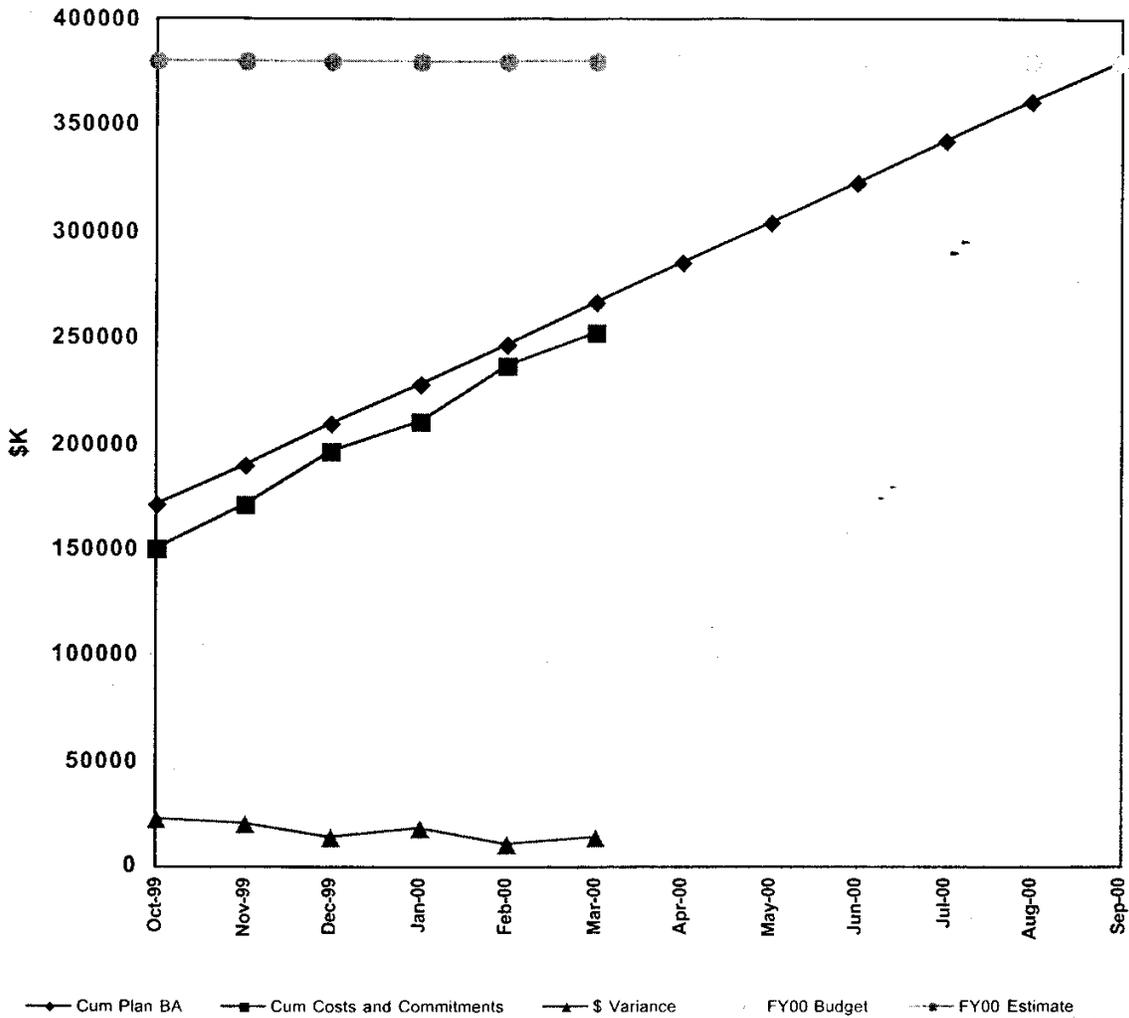
Month	Monthly		Cumulative				FY2000 Budget *	FY2000 Estimate *
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	12,057	9,690	12,057	9,690	2,367	20%	311,520	311,520
Nov-99	27,224	17,043	39,281	26,733	12,548	32%	311,520	311,520
Dec-99	27,224	20,136	66,505	46,870	19,635	30%	311,520	311,520
Jan-00	27,224	17,601	93,729	64,471	29,258	31%	311,520	311,520
Feb-00	27,224	23,662	120,953	88,133	32,820	27%	311,520	311,520
Mar-00	27,224	18,329	148,176	106,461	41,715	28%	311,520	311,520
Apr-00	27,224		175,400				311,520	
May-00	27,224		202,624				311,520	
Jun-00	27,224		229,848				311,520	
Jul-00	27,224		257,072				311,520	
Aug-00	27,224		284,296				311,520	
Sep-00	27,224		311,520				311,520	

* Rebaselining in progress will establish Project TPC BAC/EAC.

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FY2000 Plan to Actual as of March 2000
Total Project Cost (TPC) - Cost and Commitments (\$K)

Project Number 96-D-111
 March 2000



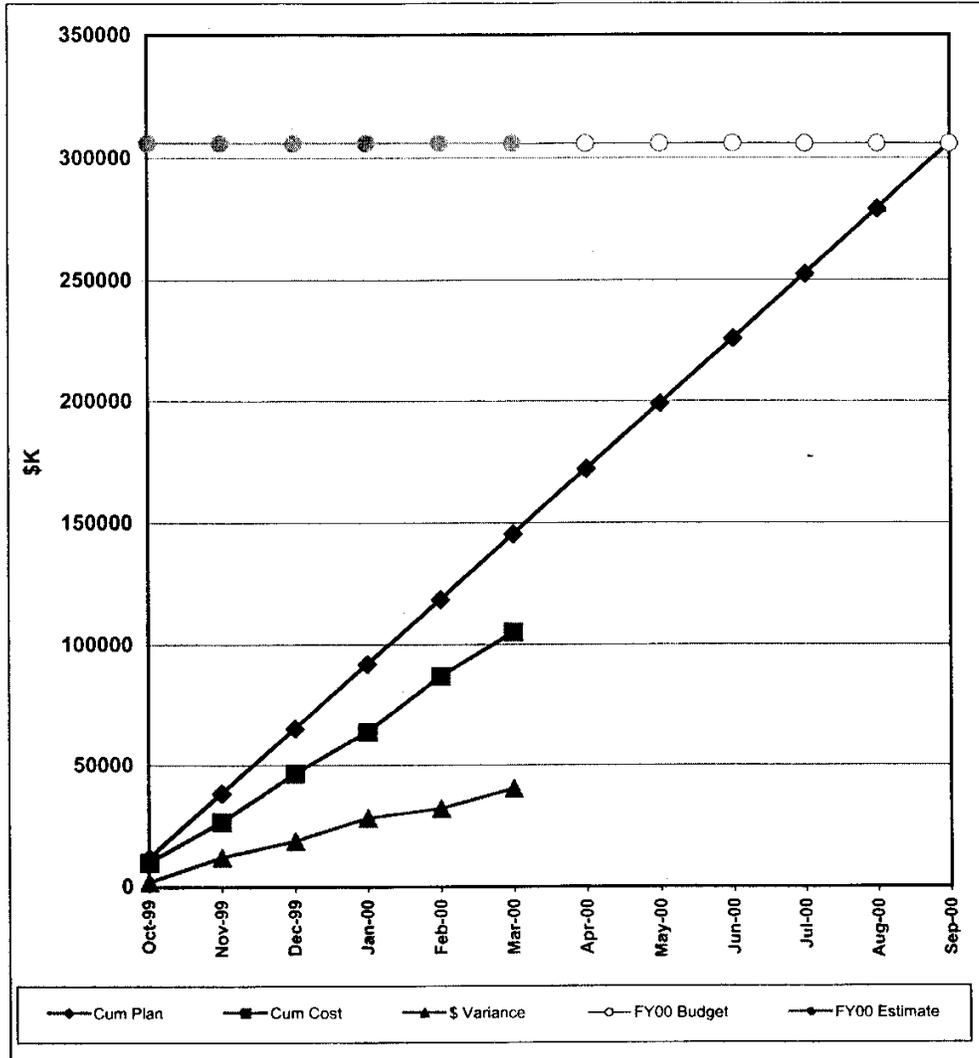
Month	Monthly		Cumulative				FY2000 Budget *	FY2000 Estimate *
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	171,009 **	149,362	171,009 **	149,362	21,647	13%	380,409	380,409
Nov-99	19,036	21,090	190,045	170,452	19,593	10%	380,409	380,409
Dec-99	19,036	25,391	209,082	195,843	13,239	6%	380,409	380,409
Jan-00	19,036	14,699	228,118	210,542	17,577	8%	380,409	380,409
Feb-00	19,036	26,800	247,155	237,342	9,813	4%	380,409	380,409
Mar-00	19,036	15,326	266,191	252,668	13,523	5%	380,409	380,409
Apr-00	19,036		285,227				380,409	
May-00	19,036		304,264				380,409	
Jun-00	19,036		323,300				380,409	
Jul-00	19,036		342,337				380,409	
Aug-00	19,036		361,373				380,409	
Sep-00	19,036		380,409				380,409	

* Rebaselining in progress will establish Project TPC BAC/EAC.
 ** Includes \$126,612K of uncosted obligations from FY99.

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**FY2000 Cost Plan to Actual
as of March 2000
Total Estimated Cost (TEC) (\$K)**

Project Number 96-D-111
March 2000



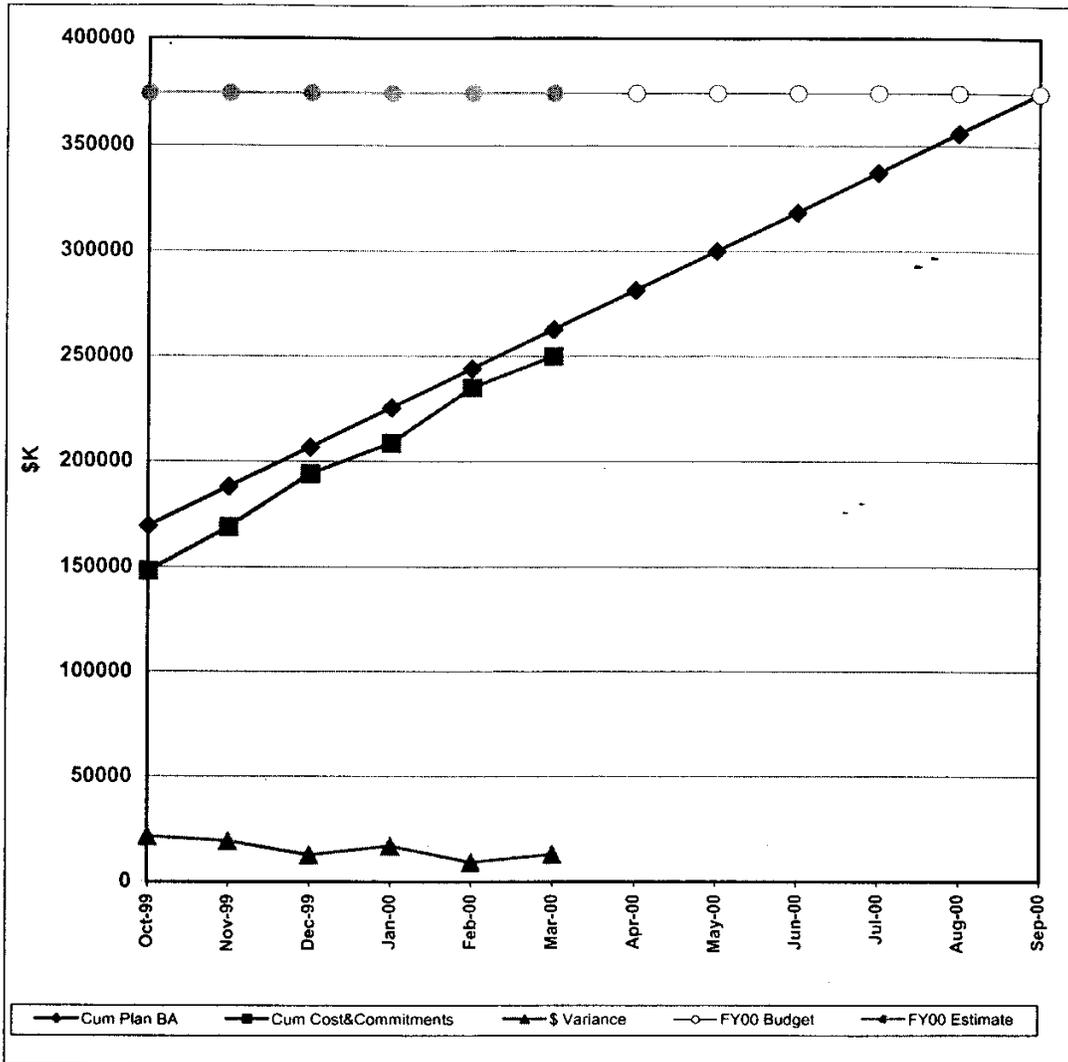
Month	Monthly		Cumulative				FY2000 Budget *	FY2000 Estimate *
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	11,647	9,826	11,647	9,826	1,821	16%	306,054	306,054
Nov-99	26,764	16,570	38,411	26,395	12,016	31%	306,054	306,054
Dec-99	26,764	20,132	65,176	46,528	18,648	29%	306,054	306,054
Jan-00	26,764	17,295	91,940	63,823	28,117	31%	306,054	306,054
Feb-00	26,764	22,957	118,704	86,779	31,925	27%	306,054	306,054
Mar-00	26,764	18,325	145,468	105,104	40,364	28%	306,054	306,054
Apr-00	26,764		172,233				306,054	
May-00	26,764		198,997				306,054	
Jun-00	26,764		225,761				306,054	
Jul-00	26,764		252,526				306,054	
Aug-00	26,764		279,290				306,054	
Sep-00	26,764		306,054				306,054	

* Rebaselining in progress will establish Project TEC BAC/EAC.

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FY2000 Plan to Actual as of March 2000
Total Estimated Cost (TEC) - Cost and Commitments (\$K)

Project Number 96-D-111
 March 2000



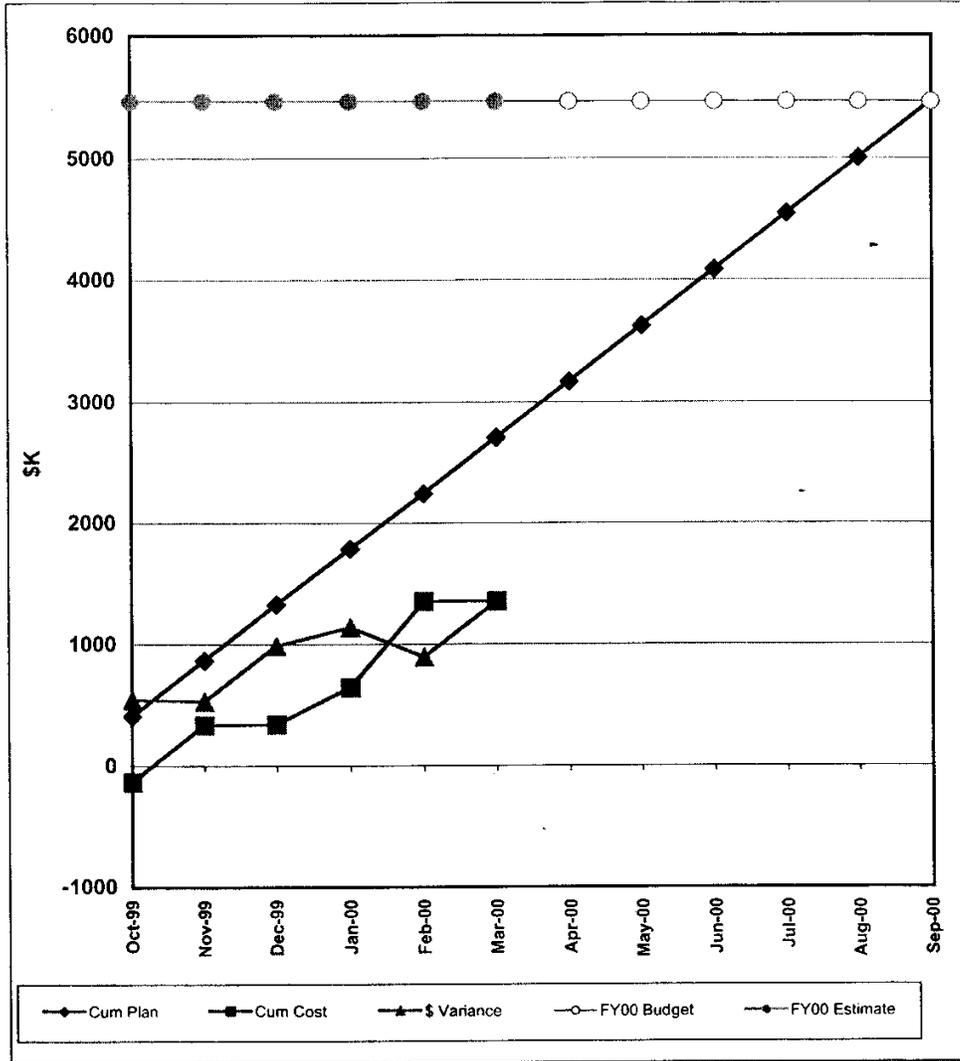
Month	Monthly		Cumulative				FY2000	FY2000
	Planned	Actual	Planned	Actual	\$ Var	% Var	Budget*	Estimate
Oct-98	169,417	** 148,023	169,417	** 148,023	21,394	13%	374,416	374,416
Nov-98	18,636	20,837	188,053	168,860	19,194	10%	374,416	374,416
Dec-98	18,636	25,315	206,690	194,175	12,515	6%	374,416	374,416
Jan-99	18,636	14,429	225,326	208,604	16,722	7%	374,416	374,416
Feb-99	18,636	26,251	243,962	234,855	9,108	4%	374,416	374,416
Mar-99	18,636	14,981	262,599	249,836	12,763	5%	374,416	374,416
Apr-99	18,636		281,235				374,416	
May-99	18,636		299,871				374,416	
Jun-99	18,636		318,507				374,416	
Jul-99	18,636		337,144				374,416	
Aug-99	18,636		355,780				374,416	
Sep-99	18,636		374,416				374,416	

* Rebaselining in progress will establish Project TEC BAC/EAC.
 ** Includes \$124,820K of uncosted obligations from FY99.

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**FY2000 Cost Plan to Actual
as of March 2000
Other Project Cost (OPC) (\$K)**

Project Number 96-D-111
March 2000



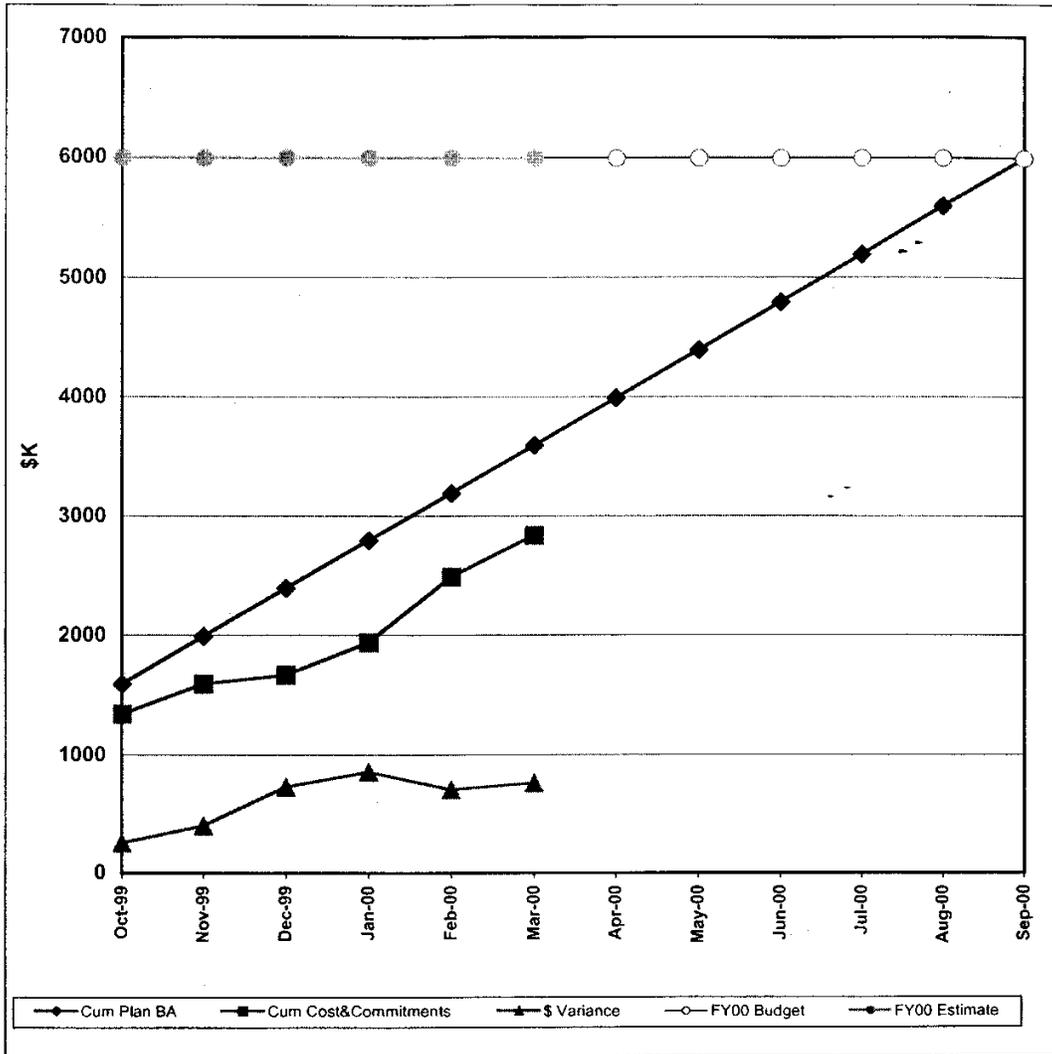
Month	Monthly		Cumulative				FY2000	FY2000
	Planned	Actual	Planned	Actual	\$ Var	% Var	Budget *	Estimate *
Oct-99	410	-135	410	-135	545	133%	5,466	5,466
Nov-99	460	474	870	338	531	61%	5,466	5,466
Dec-99	460	4	1,329	342	987	74%	5,466	5,466
Jan-00	460	306	1,789	648	1,141	64%	5,466	5,466
Feb-00	460	705	2,248	1,353	895	40%	5,466	5,466
Mar-00	460	4	2,708	1,357	1,351	50%	5,466	5,466
Apr-00	460		3,168				5,466	
May-00	460		3,627				5,466	
Jun-00	460		4,087				5,466	
Jul-00	460		4,546				5,466	
Aug-00	460		5,006				5,466	
Sep-00	460		5,466				5,466	

* Rebaselining in progress will establish Project OPC BAC/EAC.

FY2000 Plan to Actual as of March 2000
Other Project Cost (OPC) - Cost and Commitments (\$K)

Project Number 96-D-111
 March 2000

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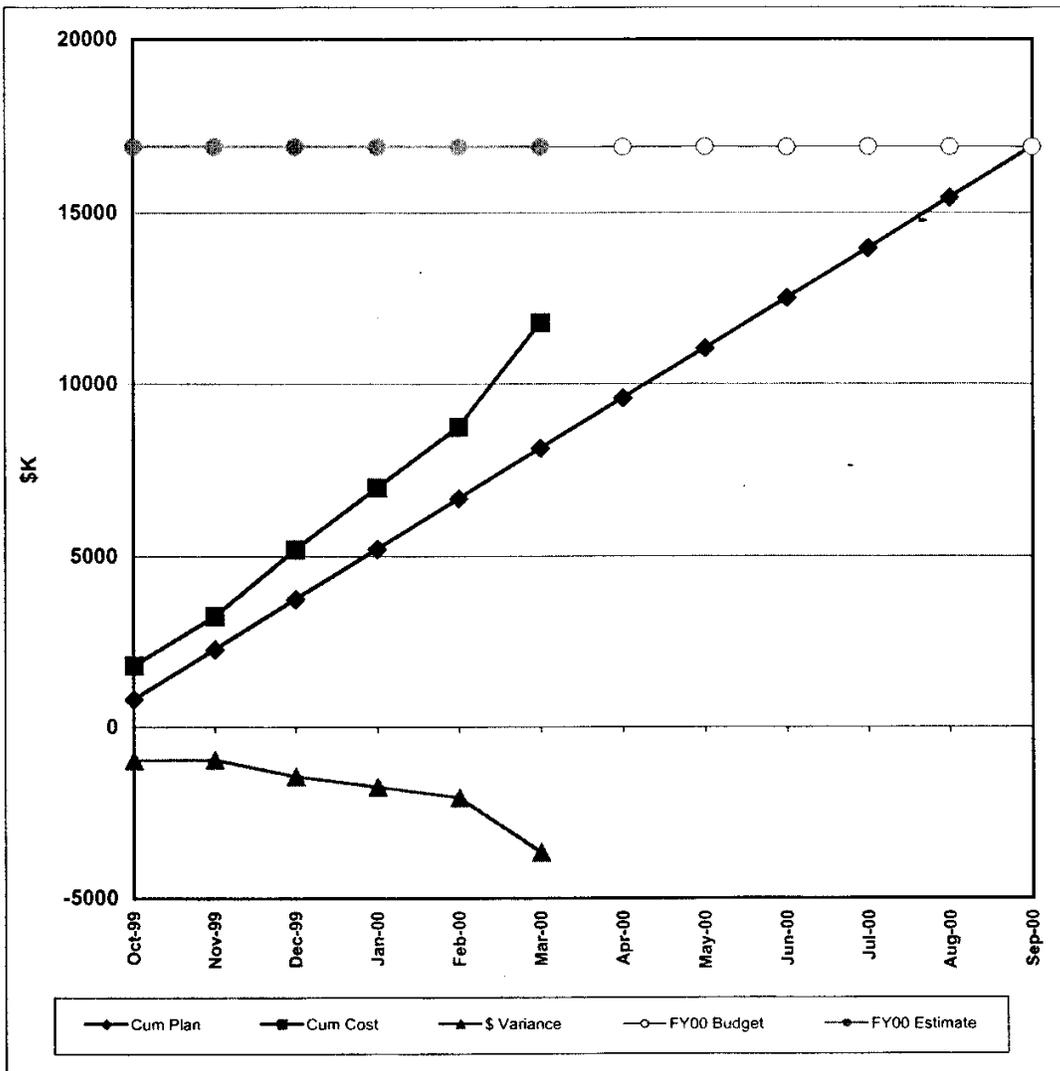
Month	Monthly		Cumulative				FY2000 Budget *	FY2000 Estimate *
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,592 **	1,339	1,592 **	1,339	253	16%	5,993	5,993
Nov-99	400	253	1,992	1,592	400	20%	5,993	5,993
Dec-99	400	75	2,392	1,668	724	30%	5,993	5,993
Jan-00	400	270	2,792	1,938	854	31%	5,993	5,993
Feb-00	400	549	3,192	2,487	705	22%	5,993	5,993
Mar-00	400	345	3,593	2,832	760	21%	5,993	5,993
Apr-00	400		3,993				5,993	
May-00	400		4,393				5,993	
Jun-00	400		4,793				5,993	
Jul-00	400		5,193				5,993	
Aug-00	400		5,593				5,993	
Sep-00	400		5,993				5,993	

* Rebaselining in progress will establish Project OPC BAC/EAC.
 ** Includes \$1,792K of uncosted obligations from FY99.

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**FY2000 Cost Plan to Actual as of March 2000
WBS 1.1 - Project Office Cost (\$K)**

Project Number 96-D-111
March 2000

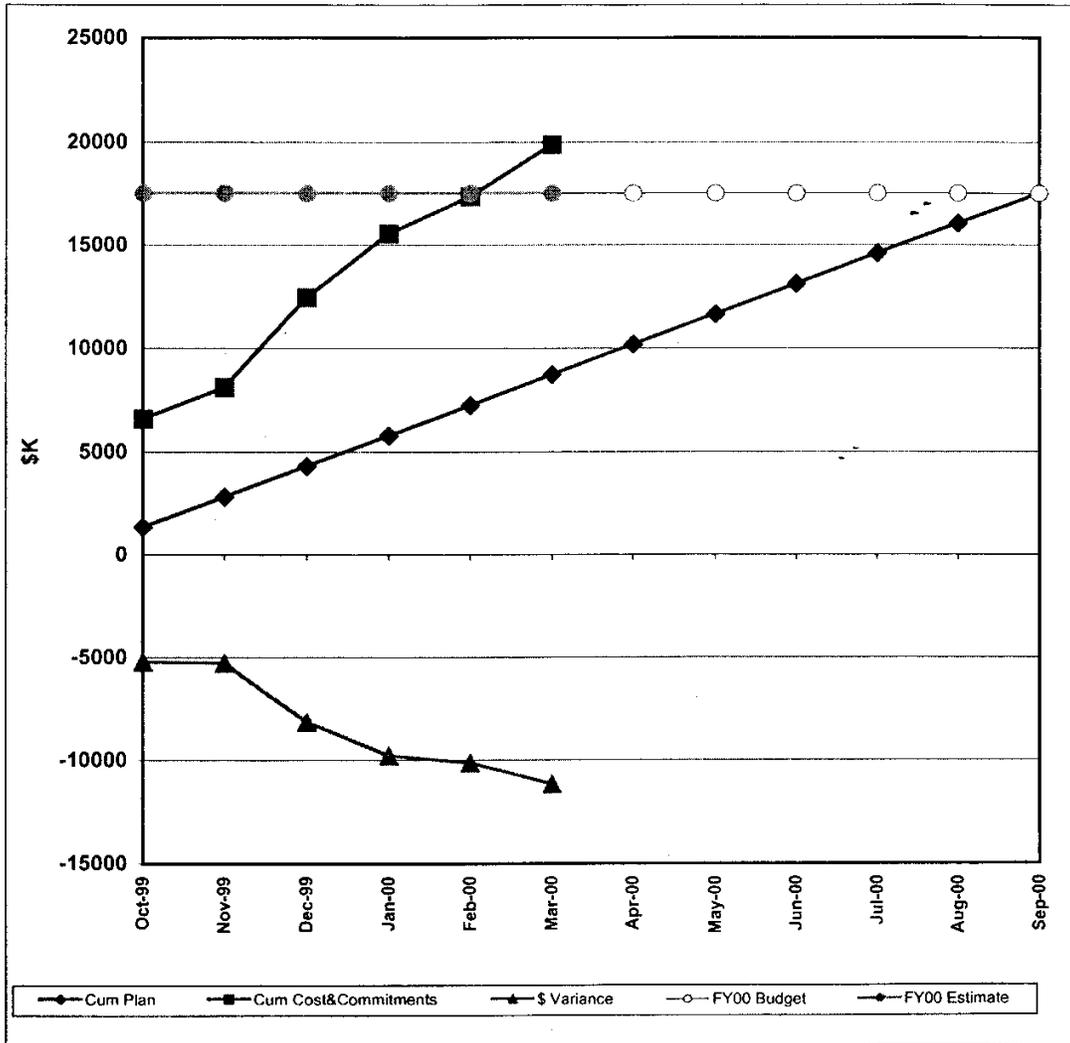


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	821	1,812	821	1,812	-991	-121%	16,907	16,907
Nov-98	1,462	1,442	2,283	3,254	-970	-42%	16,907	16,907
Dec-98	1,462	1,943	3,746	5,197	-1,451	-39%	16,907	16,907
Jan-99	1,462	1,780	5,208	6,978	-1,769	-34%	16,907	16,907
Feb-99	1,462	1,772	6,671	8,749	-2,079	-31%	16,907	16,907
Mar-99	1,462	3,058	8,133	11,807	-3,674	-45%	16,907	16,907
Apr-99	1,462		9,595				16,907	
May-99	1,462		11,058				16,907	
Jun-99	1,462		12,520				16,907	
Jul-99	1,462		13,983				16,907	
Aug-99	1,462		15,445				16,907	
Sep-99	1,462		16,907				16,907	

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**FY2000 Cost and Commitment Plan to Actual
as of March 2000
WBS 1.1 - Project Office (\$K)**

Project Number 96-D-111
March 2000

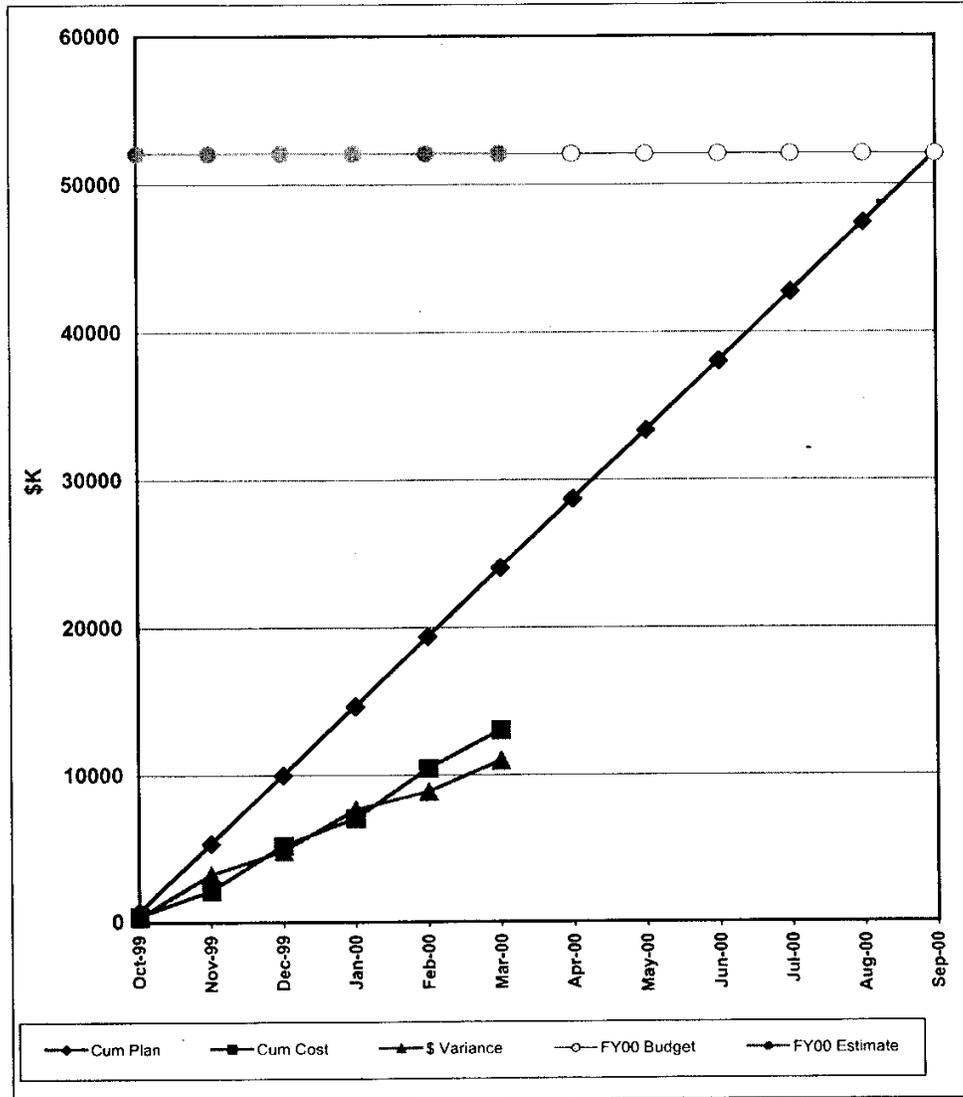


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	1,358 *	6,571	1,358 *	6,571	-5,213	-384%	17,537	17,537
Nov-98	1,471	1,531	2,829	8,103	-5,274	-186%	17,537	17,537
Dec-98	1,471	4,346	4,300	12,449	-8,149	-190%	17,537	17,537
Jan-99	1,471	3,092	5,770	15,541	-9,771	-169%	17,537	17,537
Feb-99	1,471	1,830	7,241	17,371	-10,130	-140%	17,537	17,537
Mar-99	1,471	2,498	8,712	19,869	-11,157	-128%	17,537	17,537
Apr-99	1,471		10,183				17,537	
May-99	1,471		11,654				17,537	
Jun-99	1,471		13,124				17,537	
Jul-99	1,471		14,595				17,537	
Aug-99	1,471		16,066				17,537	
Sep-99	1,471		17,537				17,537	

* Includes \$4,263K of uncosted obligations from FY99.

FY2000 Cost Plan to Actual as of March 2000
WBS 1.2 - Site and Conventional
Facilities Cost (\$K)

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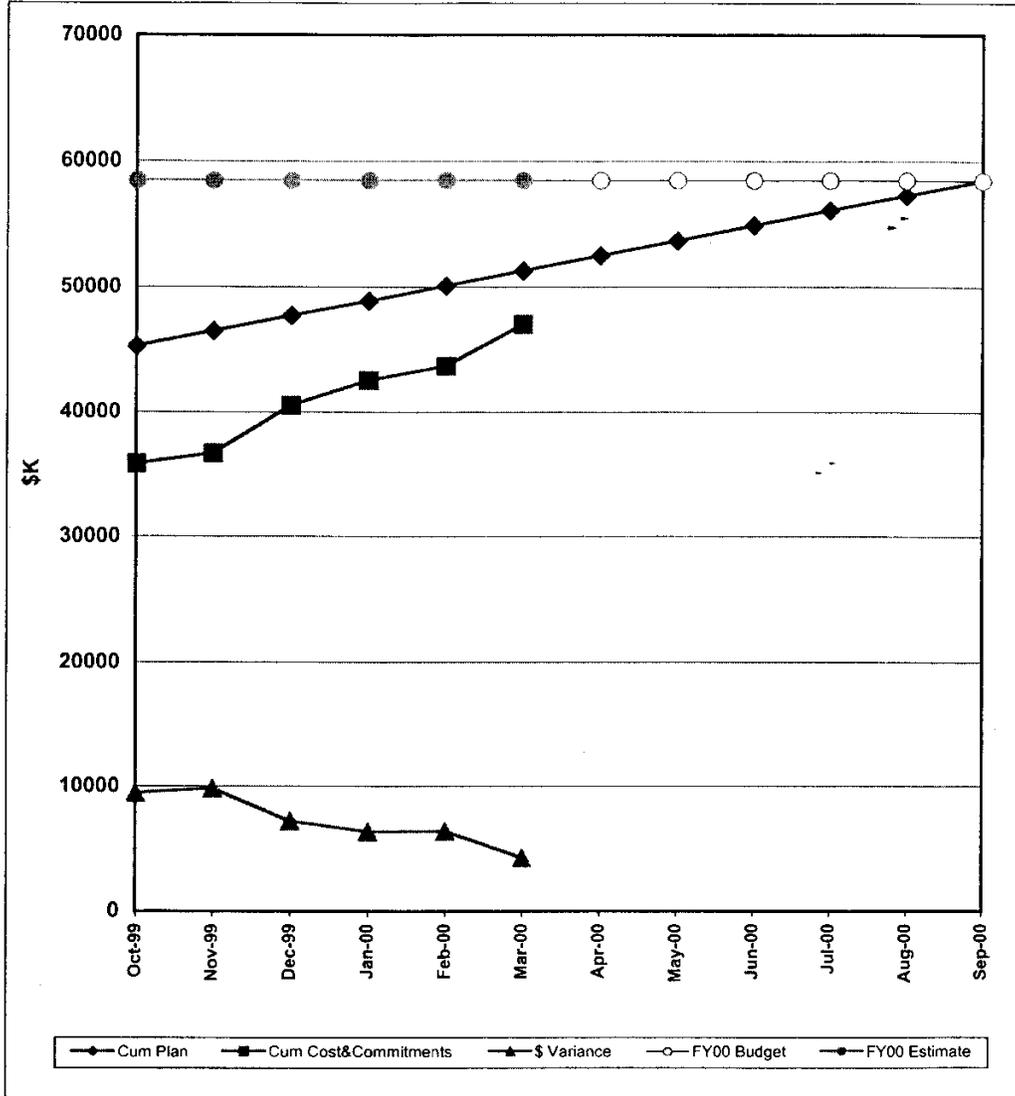


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	664	363	664	363	301	45%	52,090	52,090
Nov-98	4,675	1,767	5,339	2,130	3,209	60%	52,090	52,090
Dec-98	4,675	3,057	10,014	5,187	4,827	48%	52,090	52,090
Jan-99	4,675	1,852	14,689	7,040	7,650	52%	52,090	52,090
Feb-99	4,675	3,442	19,364	10,481	8,883	46%	52,090	52,090
Mar-99	4,675	2,567	24,040	13,048	10,991	46%	52,090	52,090
Apr-99	4,675		28,715				52,090	
May-99	4,675		33,390				52,090	
Jun-99	4,675		38,065				52,090	
Jul-99	4,675		42,740				52,090	
Aug-99	4,675		47,415				52,090	
Sep-99	4,675		52,090				52,090	

**FY2000 Cost and Commitment Plan to Actual
as of March 2000**
WBS 1.2 - Site and Conventional Facilities (\$K)

Project Number 96-D-111
March 2000

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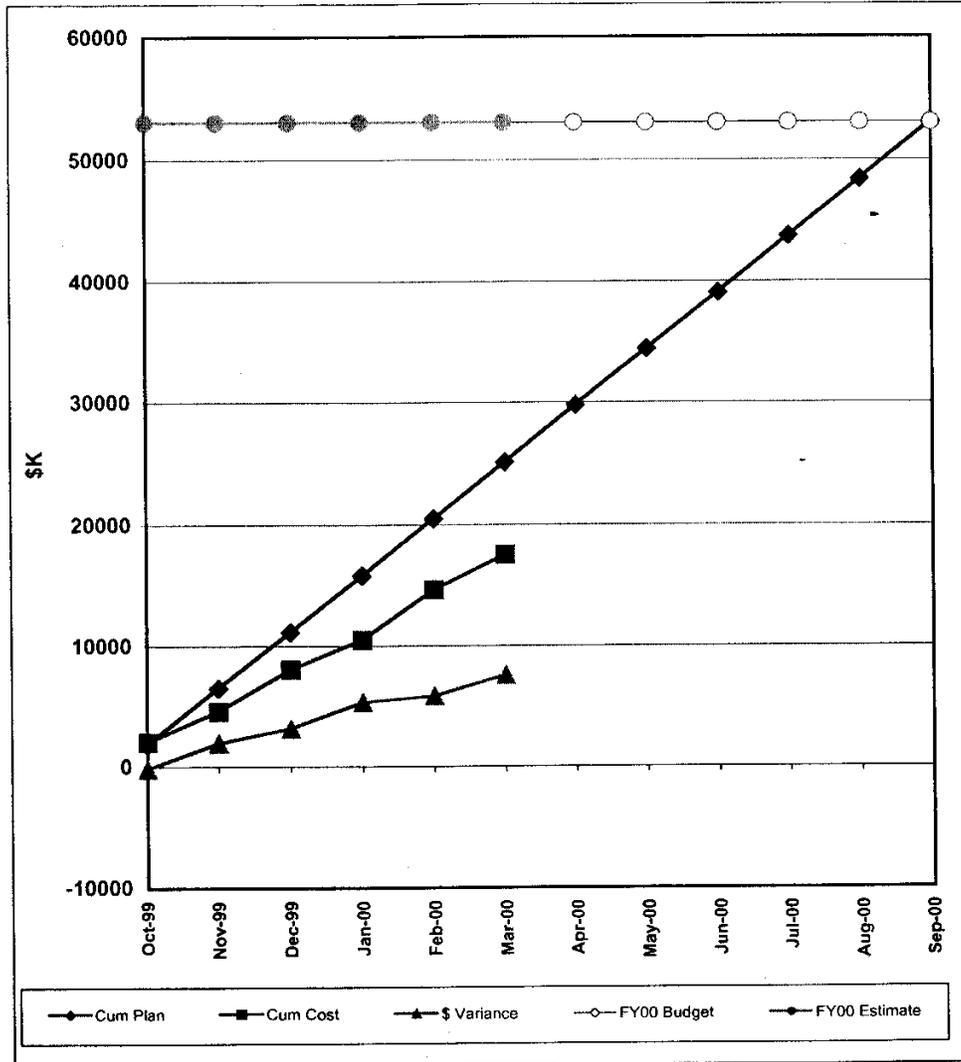


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	45,320 *	35,825	45,320 *	35,825	9,495	21%	58,466	58,466
Nov-98	1,195	860	46,515	36,685	9,830	21%	58,466	58,466
Dec-98	1,195	3,842	47,710	40,527	7,184	15%	58,466	58,466
Jan-99	1,195	2,016	48,905	42,543	6,363	13%	58,466	58,466
Feb-99	1,195	1,143	50,100	43,685	6,415	13%	58,466	58,466
Mar-99	1,195	3,372	51,296	47,057	4,239	8%	58,466	58,466
Apr-99	1,195		52,491				58,466	
May-99	1,195		53,686				58,466	
Jun-99	1,195		54,881				58,466	
Jul-99	1,195		56,076				58,466	
Aug-99	1,195		57,271				58,466	
Sep-99	1,195		58,466				58,466	

* Includes \$34,968K of uncoded obligations from FY99.

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**FY2000 Cost Plan to Actual
as of March 2000
WBS 1.3 - Lasers Systems (\$K)**

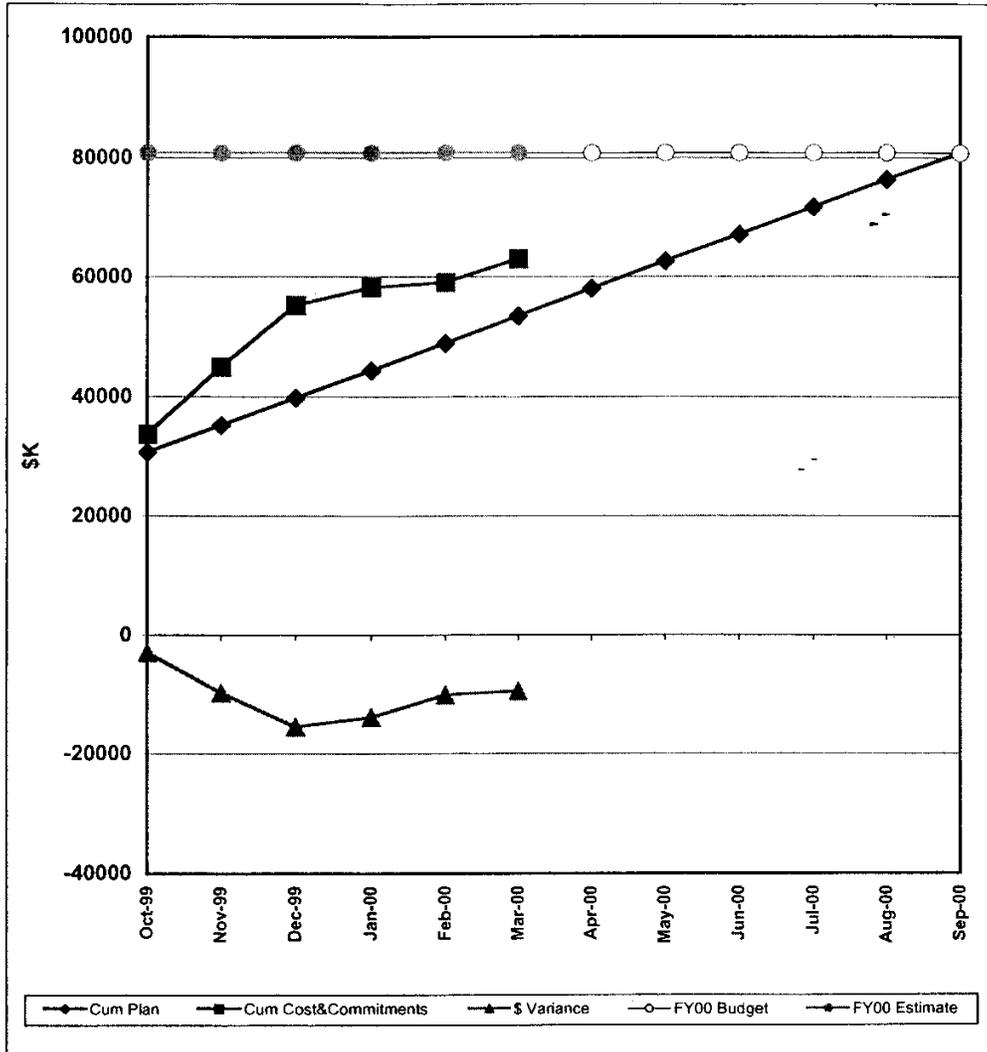


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	1,849	2,050	1,849	2,050	-201	-11%	53,083	53,083
Nov-98	4,658	2,517	6,507	4,567	1,939	30%	53,083	53,083
Dec-98	4,658	3,455	11,164	8,023	3,142	28%	53,083	53,083
Jan-99	4,658	2,463	15,822	10,485	5,336	34%	53,083	53,083
Feb-99	4,658	4,157	20,479	14,642	5,837	29%	53,083	53,083
Mar-99	4,658	2,904	25,137	17,546	7,591	30%	53,083	53,083
Apr-99	4,658		29,795				53,083	
May-99	4,658		34,452				53,083	
Jun-99	4,658		39,110				53,083	
Jul-99	4,658		43,767				53,083	
Aug-99	4,658		48,425				53,083	
Sep-99	4,658		53,083				53,083	

**FY2000 Cost and Commitment Plan to Actual
as of March 2000
WBS 1.3 - Lasers Systems (\$K)**

Project Number 96-D-111
March 2000

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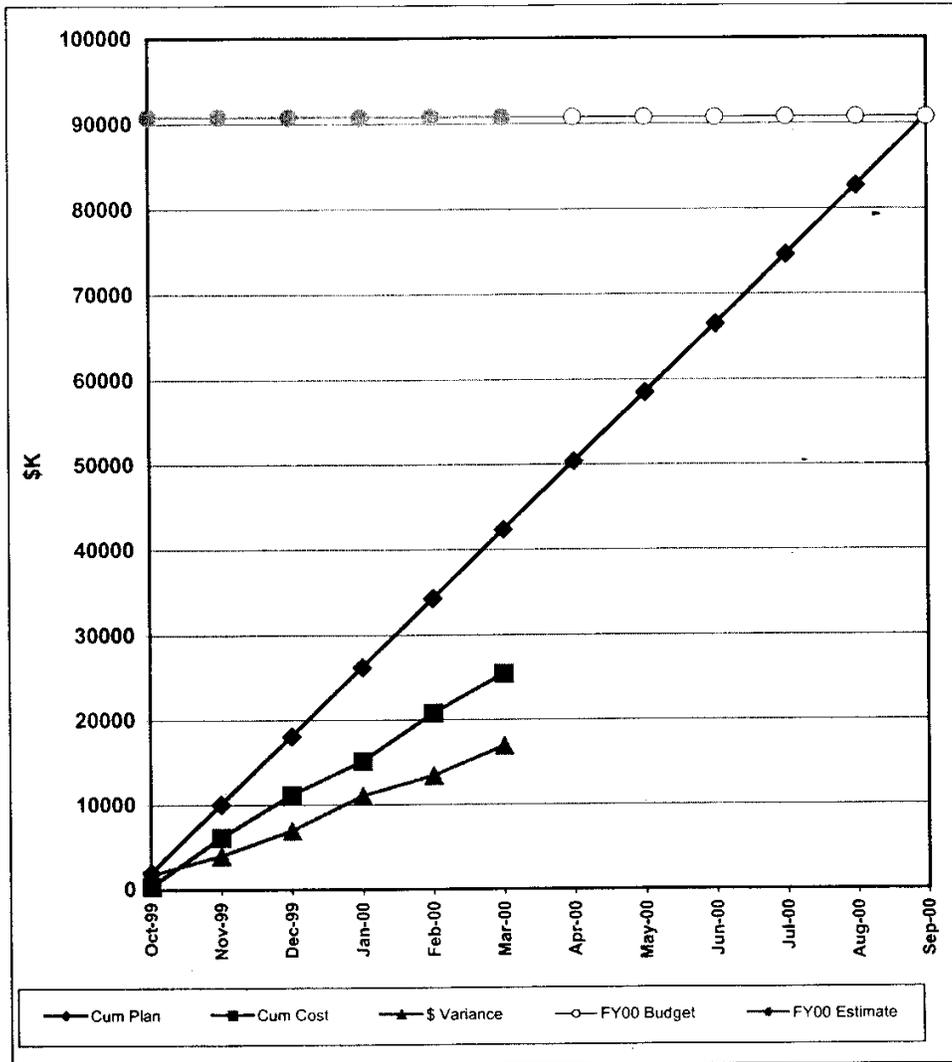
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-98	30,661 *	33,683	30,661 *	33,683	-3,022	-10%	80,840	80,840
Nov-98	4,562	11,269	35,223	44,952	-9,729	-28%	80,840	80,840
Dec-98	4,562	10,316	39,784	55,268	-15,484	-39%	80,840	80,840
Jan-99	4,562	2,990	44,346	58,259	-13,912	-31%	80,840	80,840
Feb-99	4,562	775	48,908	59,033	-10,125	-21%	80,840	80,840
Mar-99	4,562	3,947	53,470	62,980	-9,511	-18%	80,840	80,840
Apr-99	4,562		58,031				80,840	
May-99	4,562		62,593				80,840	
Jun-99	4,562		67,155				80,840	
Jul-99	4,562		71,716				80,840	
Aug-99	4,562		76,278				80,840	
Sep-99	4,562		80,840				80,840	

* Includes \$25,645K of uncosted obligations from FY99.

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**FY2000 Cost Plan to Actual
as of March 2000
WBS 1.4 - Beam Transport Systems(\$K)**

Project Number 96-D-111
March 2000

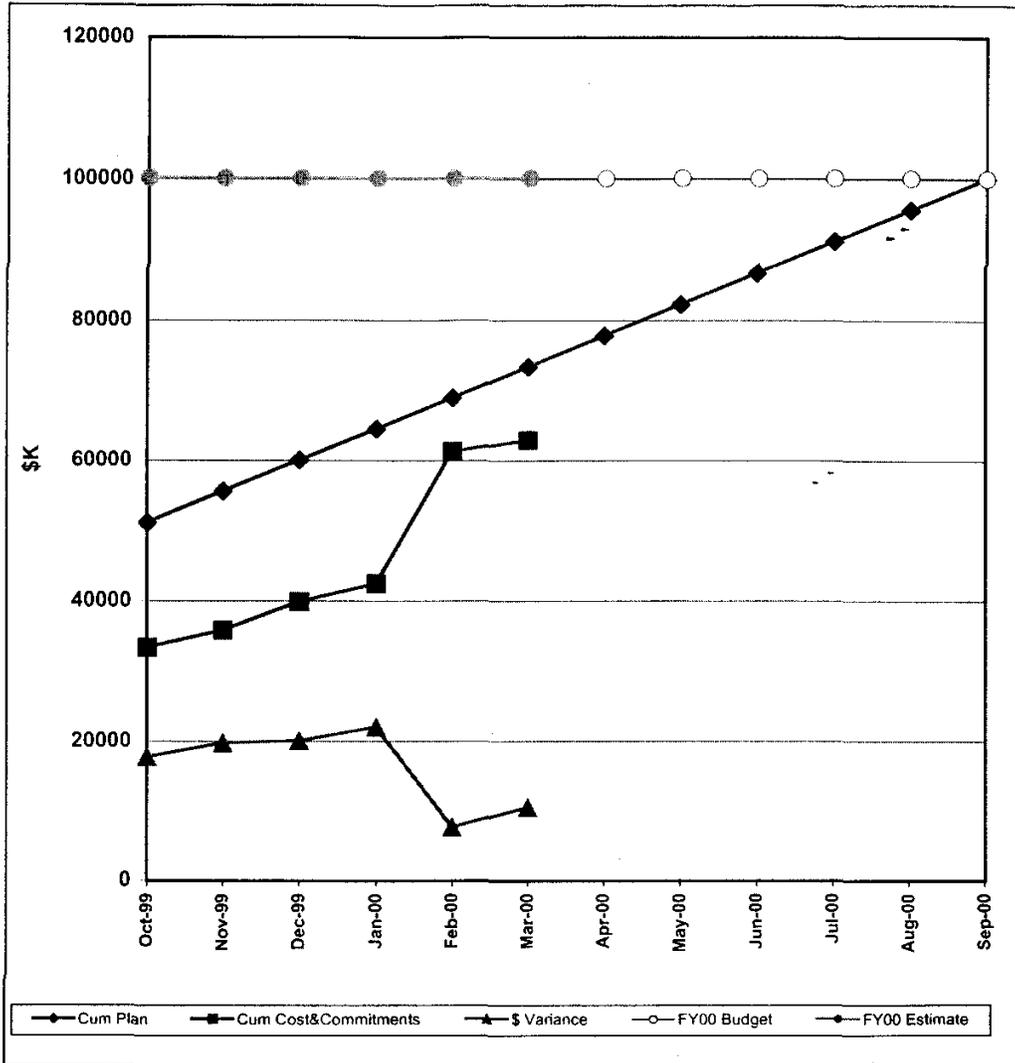


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,993	312	1,993	312	1,681	84%	90,764	90,764
Nov-99	8,070	5,793	10,063	6,106	3,957	39%	90,764	90,764
Dec-99	8,070	5,116	18,133	11,222	6,912	38%	90,764	90,764
Jan-00	8,070	3,928	26,203	15,150	11,054	42%	90,764	90,764
Feb-00	8,070	5,692	34,273	20,842	13,431	39%	90,764	90,764
Mar-00	8,070	4,586	42,344	25,428	16,915	40%	90,764	90,764
Apr-00	8,070		50,414				90,764	
May-00	8,070		58,484				90,764	
Jun-00	8,070		66,554				90,764	
Jul-00	8,070		74,624				90,764	
Aug-00	8,070		82,694				90,764	
Sep-00	8,070		90,764				90,764	

**FY2000 Cost and Commitment Plan to Actual
as of March 2000
WBS 1.4 - BeamTransport Systems (\$K)**

Project Number 96-D-111
March 2000

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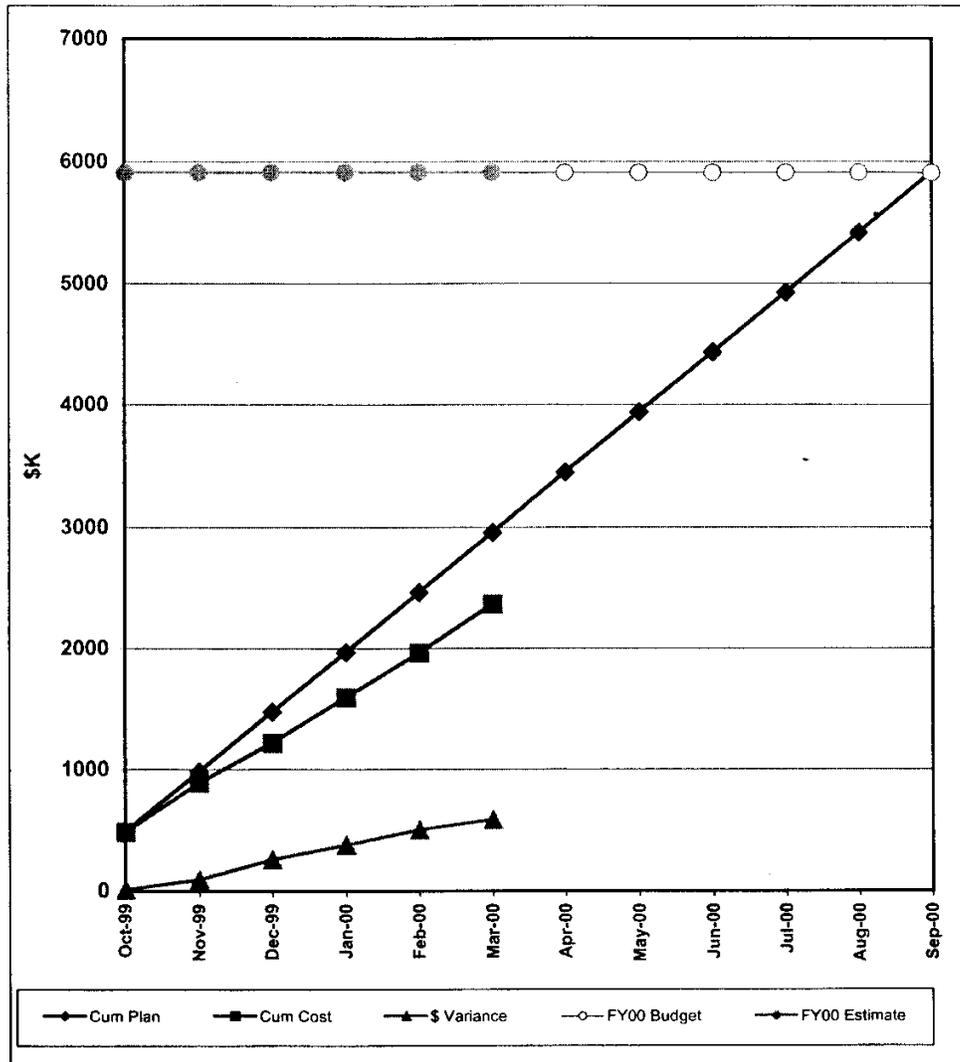
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	51,134 *	33,394	51,134 *	33,394	17,740	35%	100,106	100,106
Nov-99	4,452	2,457	55,586	35,850	19,736	36%	100,106	100,106
Dec-99	4,452	4,109	60,038	39,960	20,078	33%	100,106	100,106
Jan-00	4,452	2,535	64,490	42,495	21,995	34%	100,106	100,106
Feb-00	4,452	18,832	68,942	61,327	7,615	11%	100,106	100,106
Mar-00	4,452	1,602	73,394	62,929	10,465	14%	100,106	100,106
Apr-00	4,452		77,846				100,106	
May-00	4,452		82,298				100,106	
Jun-00	4,452		86,750				100,106	
Jul-00	4,452		91,202				100,106	
Aug-00	4,452		95,654				100,106	
Sep-00	4,452		100,106				100,106	

* Includes \$34,782K of uncosted obligations from FY99.

FY2000 Cost Plan to Actual
as of March 2000

Project Number 96-D-111
March 2000

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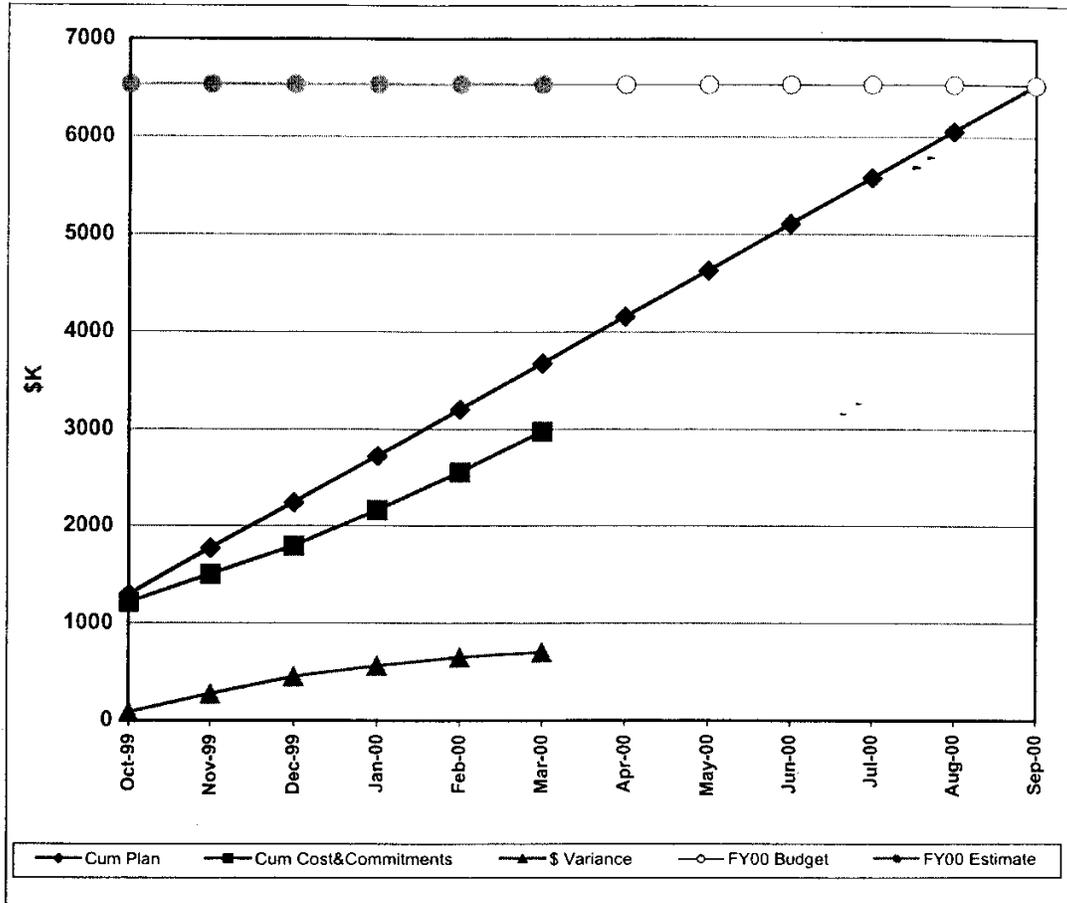


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	489	482	489	482	7	1%	5,914	5,914
Nov-99	493	407	982	889	93	10%	5,914	5,914
Dec-99	493	328	1,475	1,217	258	17%	5,914	5,914
Jan-00	493	374	1,969	1,591	377	19%	5,914	5,914
Feb-00	493	369	2,462	1,960	502	20%	5,914	5,914
Mar-00	493	409	2,955	2,369	586	20%	5,914	5,914
Apr-00	493		3,448				5,914	
May-00	493		3,941				5,914	
Jun-00	493		4,435				5,914	
Jul-00	493		4,928				5,914	
Aug-00	493		5,421				5,914	
Sep-00	493		5,914				5,914	

**FY2000 Cost and Commitment Plan to Actual
as of February 2000
WBS 1.5 - Integrated
Computer Control (\$K)**

Project Number 96-D-111
February 2000

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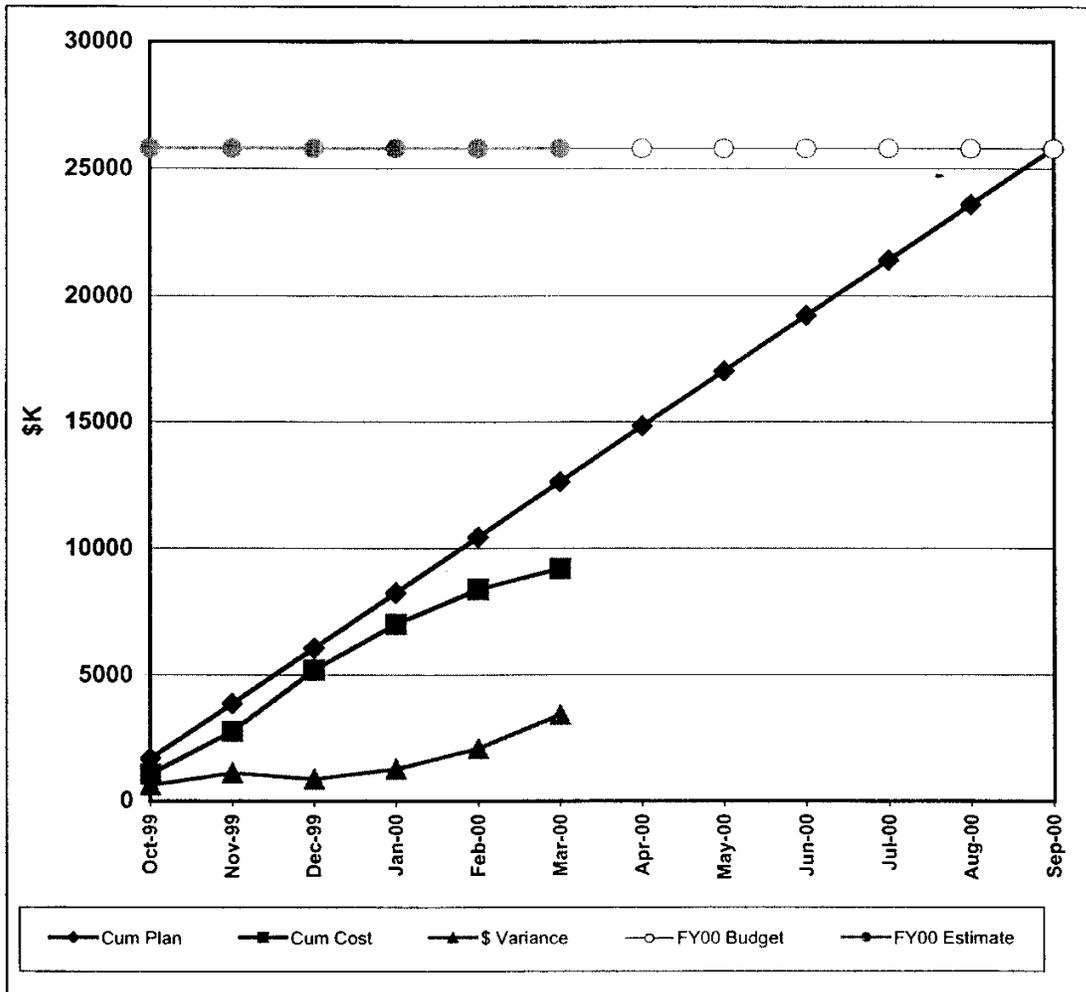
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,294 *	1,211	1,294 *	1,211	83	6%	6,536	6,536
Nov-99	477	287	1,771	1,498	273	15%	6,536	6,536
Dec-99	477	299	2,247	1,797	450	20%	6,536	6,536
Jan-00	477	369	2,724	2,166	557	20%	6,536	6,536
Feb-00	477	388	3,200	2,554	646	20%	6,536	6,536
Mar-00	477	422	3,677	2,976	701	19%	6,536	6,536
Apr-00	477		4,153				6,536	
May-00	477		4,630				6,536	
Jun-00	477		5,106				6,536	
Jul-00	477		5,583				6,536	
Aug-00	477		6,059				6,536	
Sep-00	477		6,536				6,536	

* Includes \$750K of uncosted obligations from FY99.

**FY2000 Cost Plan to Actual
as of March 2000
WBS 1.6 - Optical Components (\$K)**

Project Number 96-D-111
March 2000

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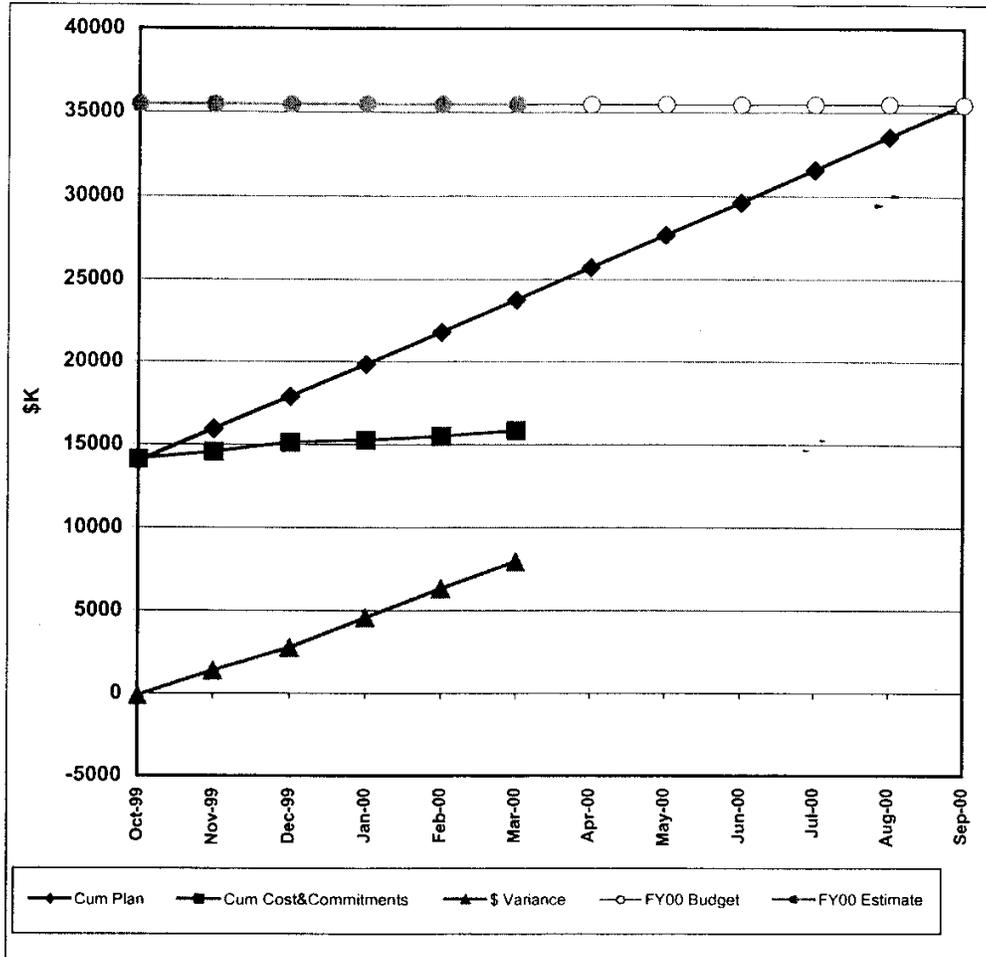


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,681	1,067	1,681	1,067	614	37%	25,798	25,798
Nov-99	2,192	1,704	3,873	2,771	1,102	28%	25,798	25,798
Dec-99	2,193	2,422	6,066	5,193	873	14%	25,798	25,798
Jan-00	2,193	1,810	8,258	7,003	1,255	15%	25,798	25,798
Feb-00	2,193	1,377	10,451	8,380	2,071	20%	25,798	25,798
Mar-00	2,193	824	12,643	9,204	3,439	27%	25,798	25,798
Apr-00	2,193		14,836				25,798	
May-00	2,193		17,028				25,798	
Jun-00	2,193		19,221				25,798	
Jul-00	2,193		21,413				25,798	
Aug-00	2,193		23,606				25,798	
Sep-00	2,193		25,798				25,798	

**FY2000 Cost and Commitment Plan to Actual
as of March 2000
WBS 1.6 - Optical Components (\$K)**

Project Number 96-D-111
March 2000

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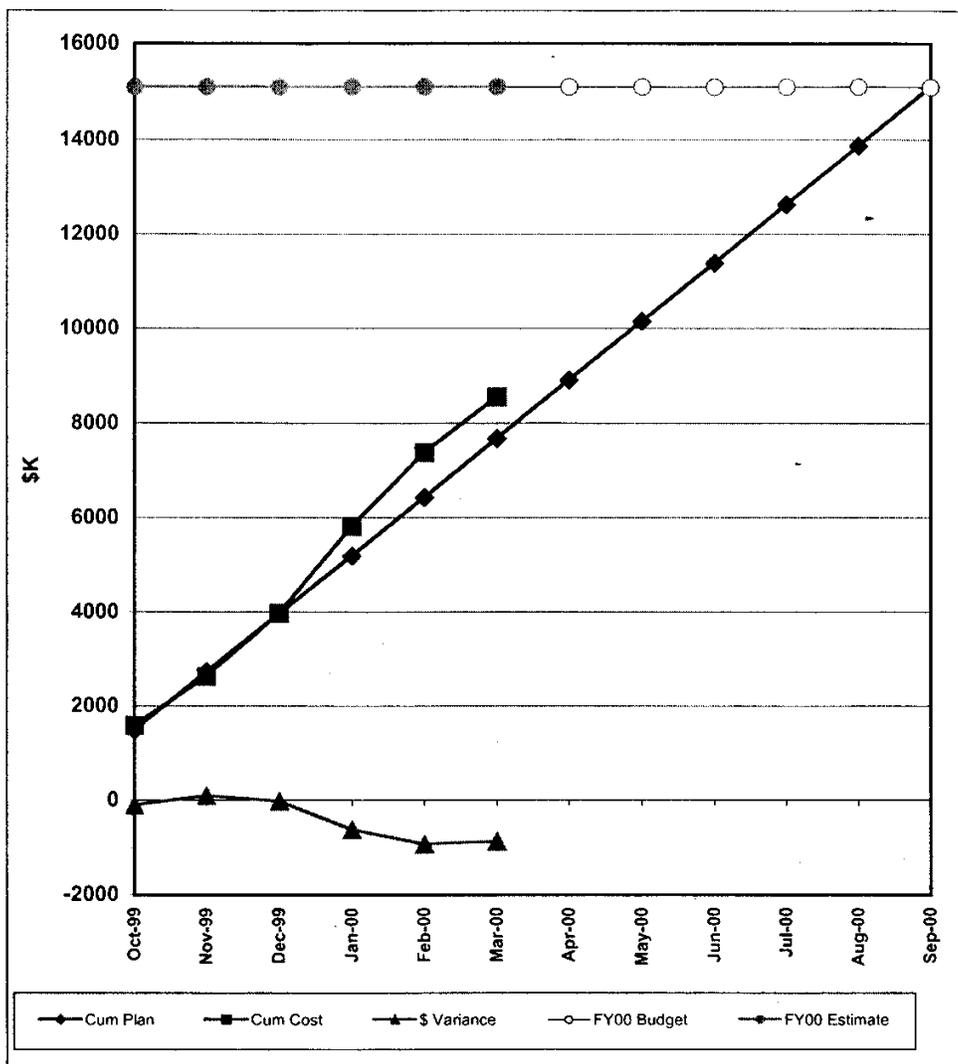
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	13,984 *	14,124	13,984 *	14,124	-140	-1%	35,473	35,473
Nov-99	1,954	441	15,938	14,565	1,373	9%	35,473	35,473
Dec-99	1,954	570	17,891	15,135	2,756	15%	35,473	35,473
Jan-00	1,954	131	19,845	15,266	4,579	23%	35,473	35,473
Feb-00	1,954	223	21,798	15,489	6,309	29%	35,473	35,473
Mar-00	1,954	326	23,752	15,815	7,937	33%	35,473	35,473
Apr-00	1,954		25,705				35,473	
May-00	1,954		27,659				35,473	
Jun-00	1,954		29,612				35,473	
Jul-00	1,954		31,566				35,473	
Aug-00	1,954		33,519				35,473	
Sep-00	1,954		35,473				35,473	

* Includes \$12,620K of uncosted obligations from FY99.

FY2000 Cost Plan to Actual as of March 2000
WBS 1.7 - Laser Control (\$K)

Project Number 96-D-111
March 2000

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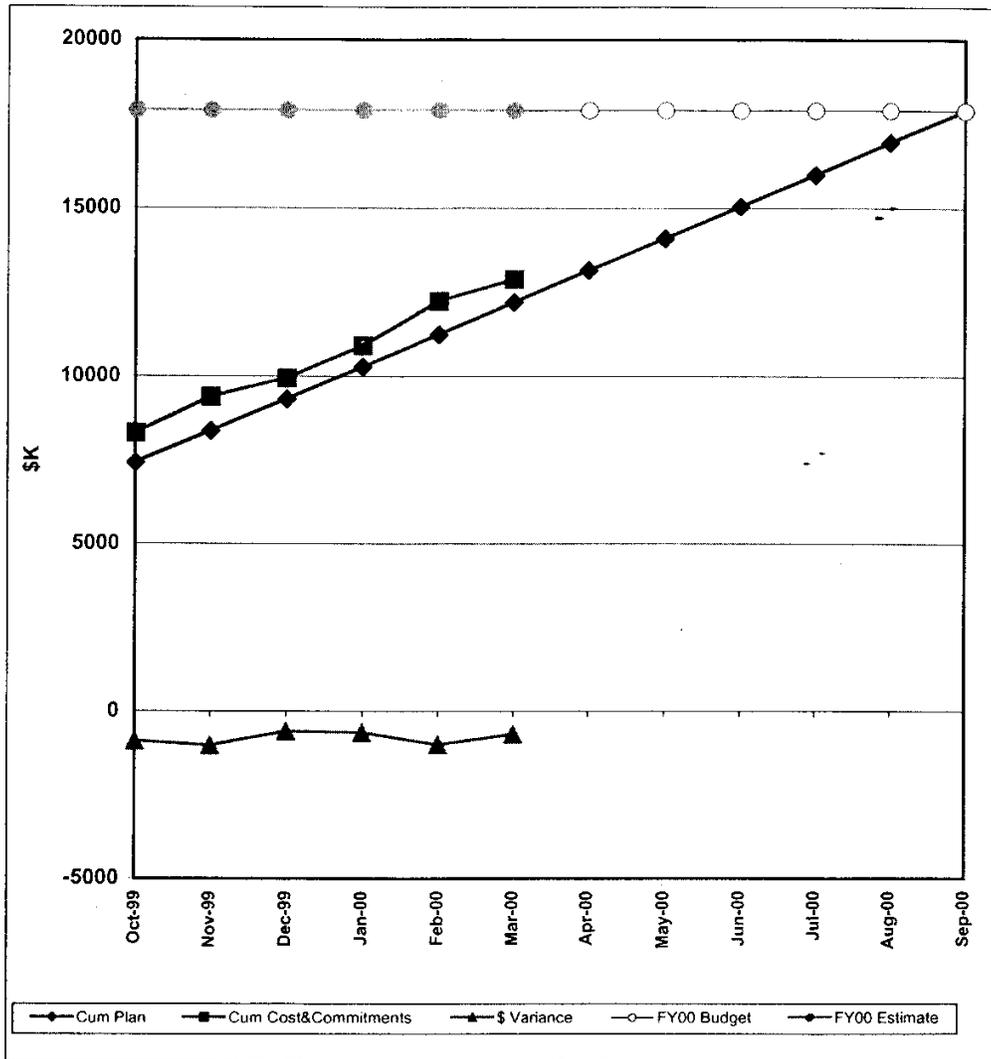


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,483	1,582	1,483	1,582	-99	-7%	15,103	15,103
Nov-99	1,238	1,042	2,721	2,625	97	4%	15,103	15,103
Dec-99	1,238	1,351	3,959	3,976	-17	0%	15,103	15,103
Jan-00	1,238	1,851	5,198	5,827	-629	-12%	15,103	15,103
Feb-00	1,238	1,547	6,436	7,374	-938	-15%	15,103	15,103
Mar-00	1,238	1,176	7,674	8,550	-876	-11%	15,103	15,103
Apr-00	1,238		8,912				15,103	
May-00	1,238		10,150				15,103	
Jun-00	1,238		11,389				15,103	
Jul-00	1,238		12,627				15,103	
Aug-00	1,238		13,865				15,103	
Sep-00	1,238		15,103				15,103	

**FY2000 Cost and Commitment Plan to Actual
as of March 2000
WBS 1.7 - Laser Control (\$K)**

Project Number 96-D-111
March 2000

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Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	7,429 *	8,309	7,429 *	8,309	-880	-12%	17,914	17,914
Nov-99	953	1,089	8,382	9,398	-1,016	-12%	17,914	17,914
Dec-99	953	544	9,335	9,942	-607	-6%	17,914	17,914
Jan-00	953	982	10,289	10,924	-636	-6%	17,914	17,914
Feb-00	953	1,312	11,242	12,236	-994	-9%	17,914	17,914
Mar-00	953	641	12,195	12,877	-682	-6%	17,914	17,914
Apr-00	953		13,148				17,914	
May-00	953		14,101				17,914	
Jun-00	953		15,055				17,914	
Jul-00	953		16,008				17,914	
Aug-00	953		16,961				17,914	
Sep-00	953		17,914				17,914	

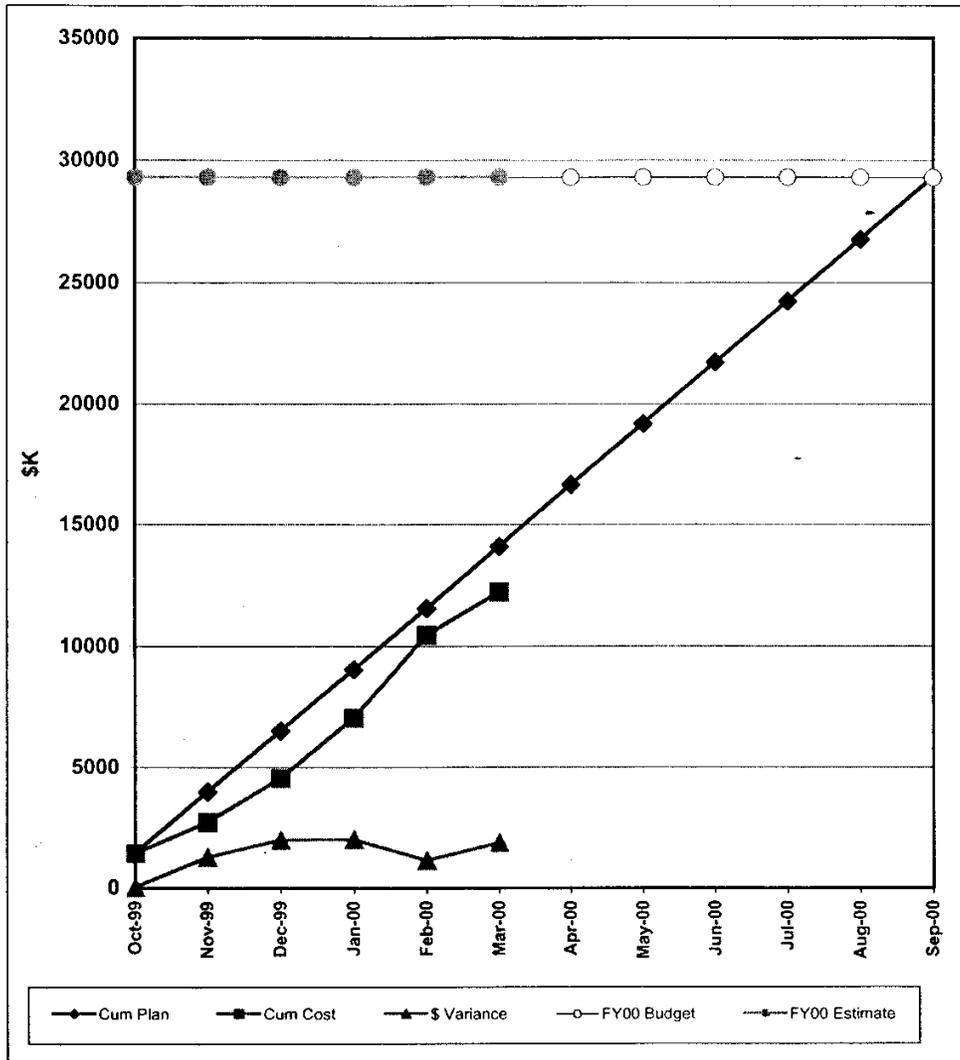
* Includes \$4,136K of uncosted obligations from FY99.

FY2000 Cost Plan to Actual
as of March 2000

Project Number 96-D-111
March 2000

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WBS 1.8 - Target Experimental System (\$K)

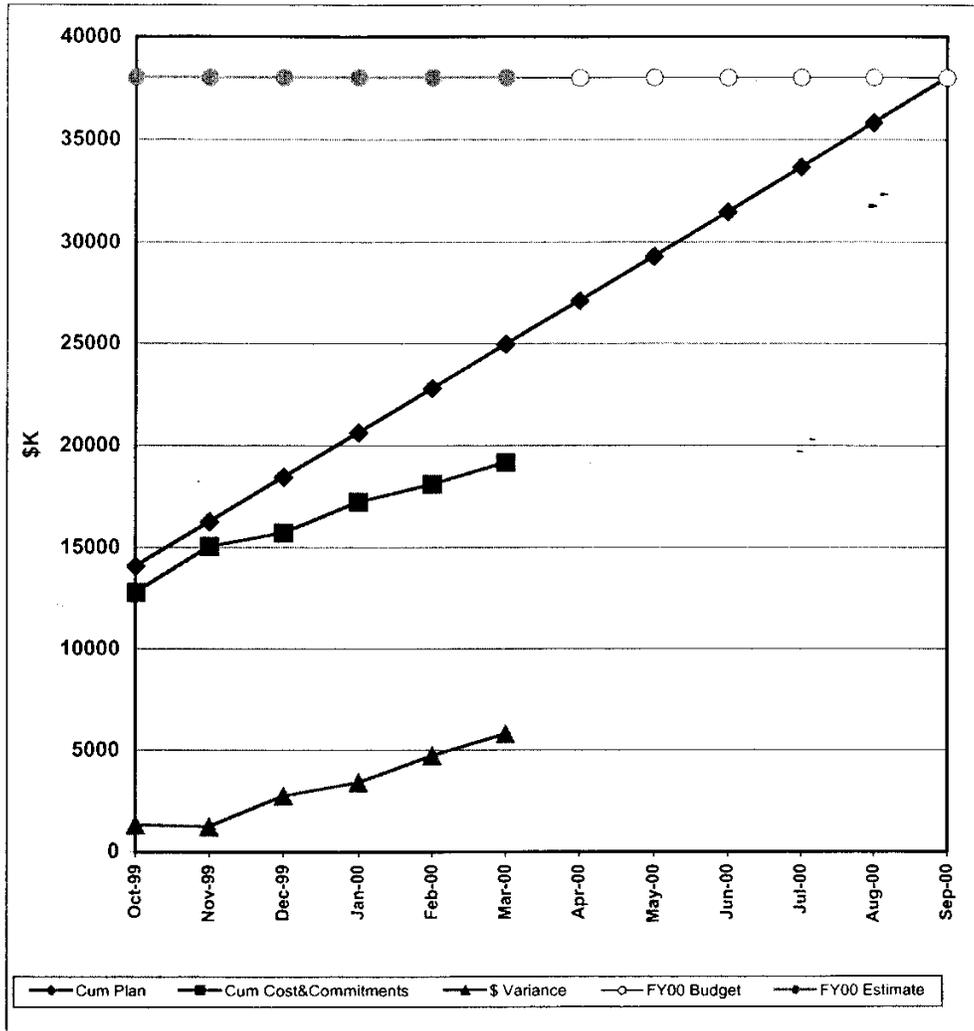


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,458	1,429	1,458	1,429	29	2%	29,303	29,303
Nov-99	2,531	1,296	3,989	2,725	1,264	32%	29,303	29,303
Dec-99	2,531	1,806	6,521	4,531	1,990	31%	29,303	29,303
Jan-00	2,531	2,521	9,052	7,052	2,000	22%	29,303	29,303
Feb-00	2,531	3,410	11,584	10,462	1,122	10%	29,303	29,303
Mar-00	2,531	1,782	14,115	12,243	1,872	13%	29,303	29,303
Apr-00	2,531		16,646				29,303	
May-00	2,531		19,178				29,303	
Jun-00	2,531		21,709				29,303	
Jul-00	2,531		24,241				29,303	
Aug-00	2,531		26,772				29,303	
Sep-00	2,531		29,303				29,303	

**FY2000 Cost and Commitment Plan to Actual
as of March 2000
WBS 1.8 - Target Experimental System (\$K)**

Project Number 96-D-111
March 2000

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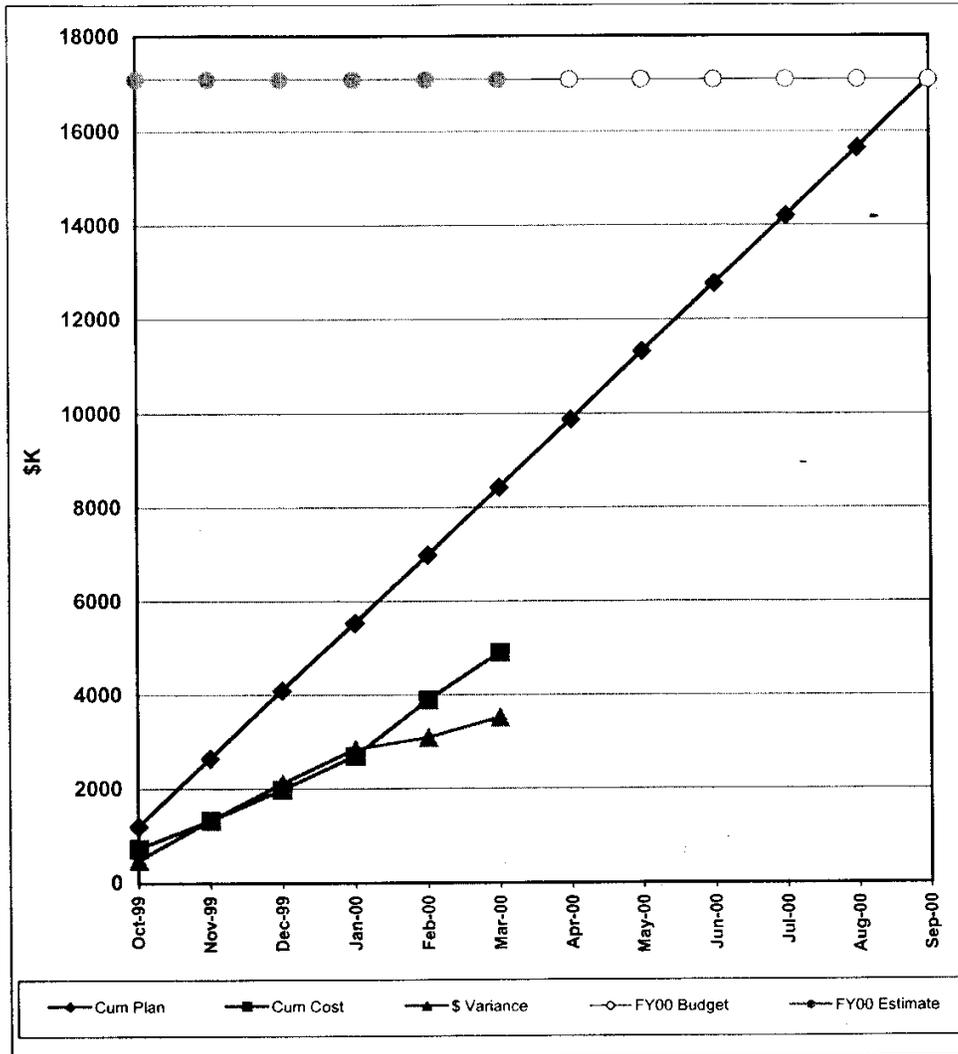
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	14,093 *	12,805	14,093 *	12,805	1,288	9%	38,008	38,008
Nov-99	2,174	2,246	16,267	15,050	1,217	7%	38,008	38,008
Dec-99	2,174	670	18,441	15,720	2,721	15%	38,008	38,008
Jan-00	2,174	1,496	20,615	17,216	3,399	16%	38,008	38,008
Feb-00	2,174	855	22,789	18,071	4,718	21%	38,008	38,008
Mar-00	2,174	1,091	24,964	19,162	5,802	23%	38,008	38,008
Apr-00	2,174		27,138				38,008	
May-00	2,174		29,312				38,008	
Jun-00	2,174		31,486				38,008	
Jul-00	2,174		33,660				38,008	
Aug-00	2,174		35,834				38,008	
Sep-00	2,174		38,008				38,008	

* Includes \$6,252K of uncosted obligations from FY99.

FY2000 Cost Plan to Actual
as of February 2000

Project Number 96-D-111
February 2000

DRAFT WBS 1.9 - Operations Special Equipment (\$K)

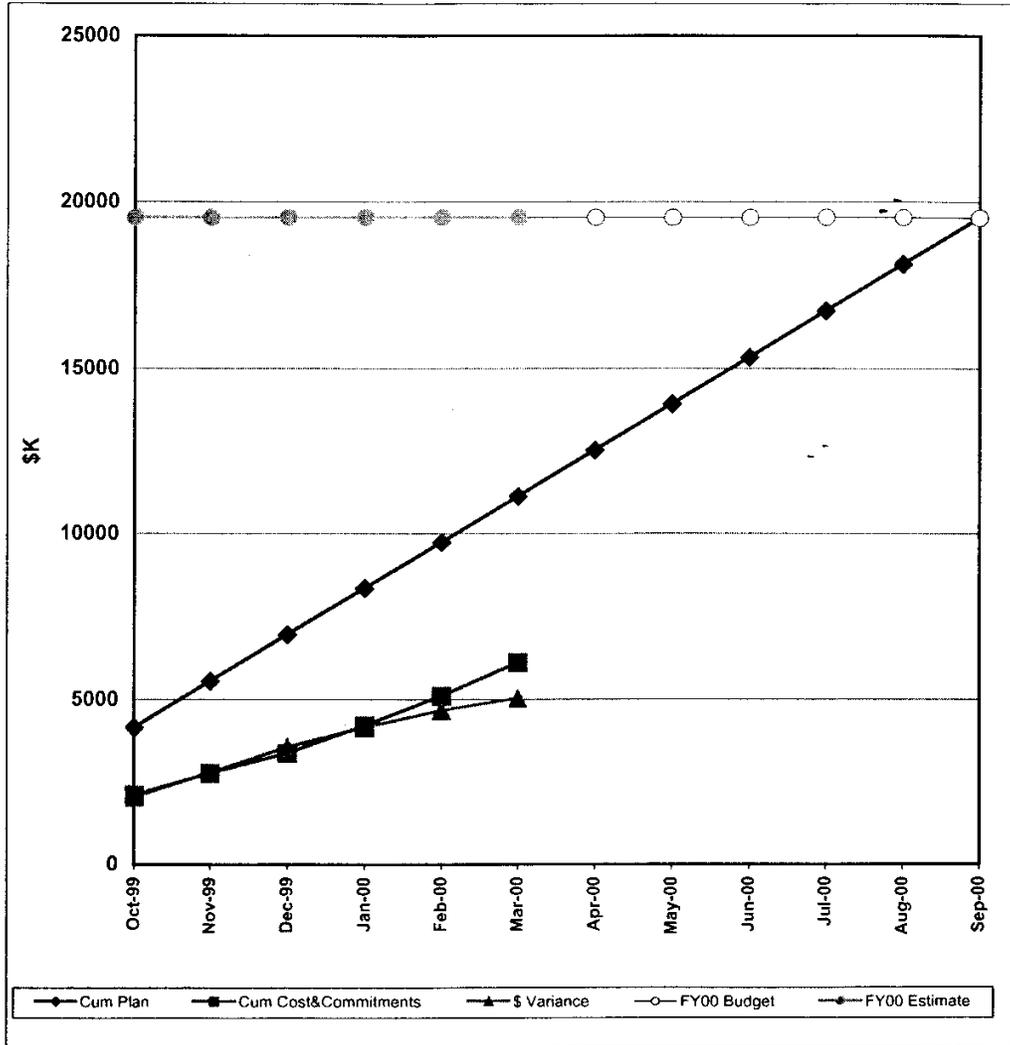


Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,209	728	1,209	728	481	40%	17,091	17,091
Nov-99	1,444	601	2,653	1,329	1,324	50%	17,091	17,091
Dec-99	1,444	653	4,097	1,982	2,115	52%	17,091	17,091
Jan-00	1,444	716	5,540	2,698	2,843	51%	17,091	17,091
Feb-00	1,444	1,191	6,984	3,889	3,095	44%	17,091	17,091
Mar-00	1,444	1,019	8,428	4,908	3,520	42%	17,091	17,091
Apr-00	1,444		9,872				17,091	
May-00	1,444		11,316				17,091	
Jun-00	1,444		12,759				17,091	
Jul-00	1,444		14,203				17,091	
Aug-00	1,444		15,647				17,091	
Sep-00	1,444		17,091				17,091	

**FY2000 Cost and Commitment Plan to Actual
as of March 2000
WBS 1.9 - Operations
Special Equipment (\$K)**

Project Number 96-D-111
March 2000

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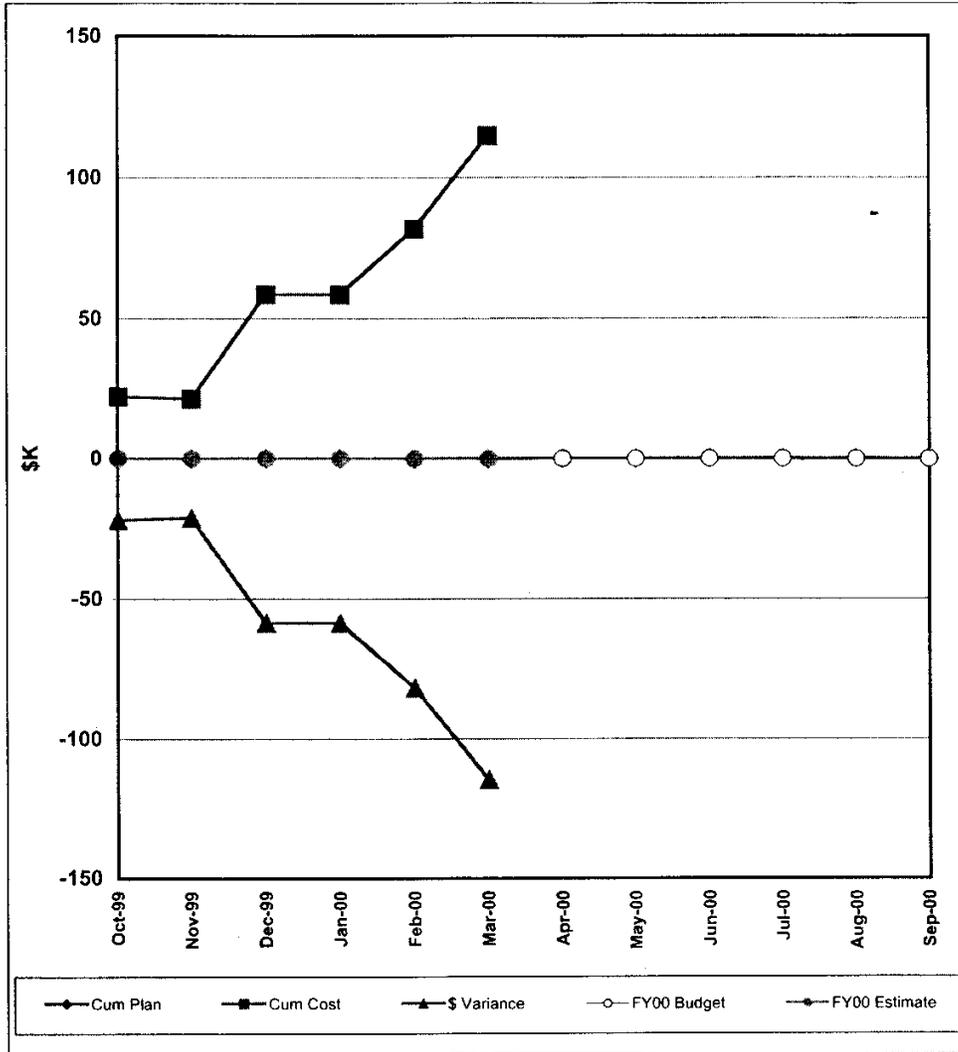
Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	4,144 *	2,102	4,144 *	2,102	2,042	49%	19,537	19,537
Nov-99	1,399	657	5,543	2,759	2,784	50%	19,537	19,537
Dec-99	1,399	618	6,943	3,377	3,566	51%	19,537	19,537
Jan-00	1,399	817	8,342	4,194	4,148	50%	19,537	19,537
Feb-00	1,399	894	9,742	5,088	4,654	48%	19,537	19,537
Mar-00	1,399	1,027	11,141	6,115	5,026	45%	19,537	19,537
Apr-00	1,399		12,540				19,537	
May-00	1,399		13,940				19,537	
Jun-00	1,399		15,339				19,537	
Jul-00	1,399		16,739				19,537	
Aug-00	1,399		18,136				19,537	
Sep-00	1,399		19,537				19,537	

* Includes \$1,404K of uncosted obligations from FY99.

**FY2000 Cost Plan to Actual
as of March 2000
WBS 1.10 - Start-up Activities (\$K)**

Project Number 96-D-111
March 2000

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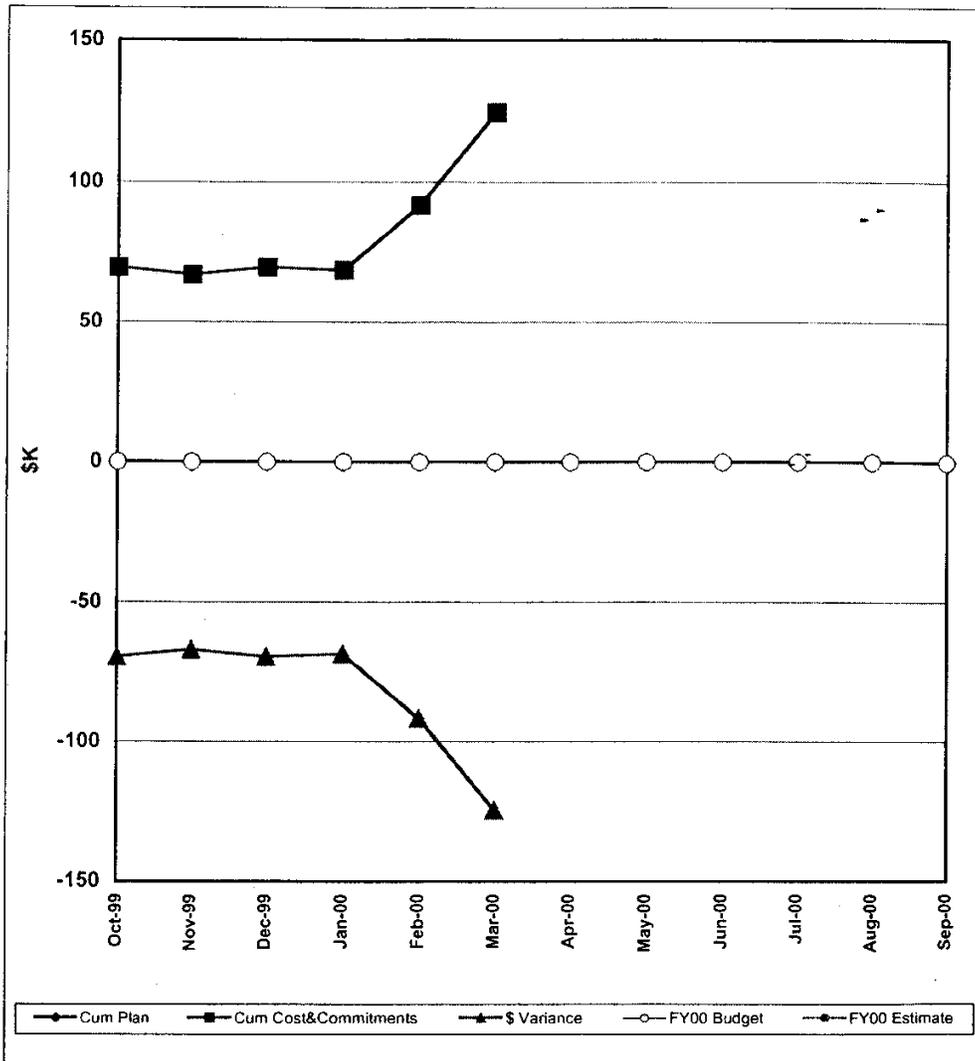
Month	Monthly		Cumulative				FY2000 Budget*	FY2000 Estimate
	Planned*	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	0	22	0	22	-22	#DIV/0!	0	-
Nov-99	0	-1	0	21	-21	#DIV/0!	0	-
Dec-99	0	37	0	59	-59	#DIV/0!	0	-
Jan-00	0	0	0	59	-59	#DIV/0!	0	-
Feb-00	0	23	0	82	-82	#DIV/0!	0	-
Mar-00	0	33	0	115	-115	#DIV/0!	0	-
Apr-00	0		0				0	
May-00	0		0				0	
Jun-00	0		0				0	
Jul-00	0		0				0	
Aug-00	0		0				0	
Sep-00	0		0				0	

* Plan will be prepared and budgeted.

**FY2000 Cost and Commitment Plan to Actual
as of March 2000
WBS 1.10 - Start-up Activities (\$K)**

Project Number 96-D-111
March 2000

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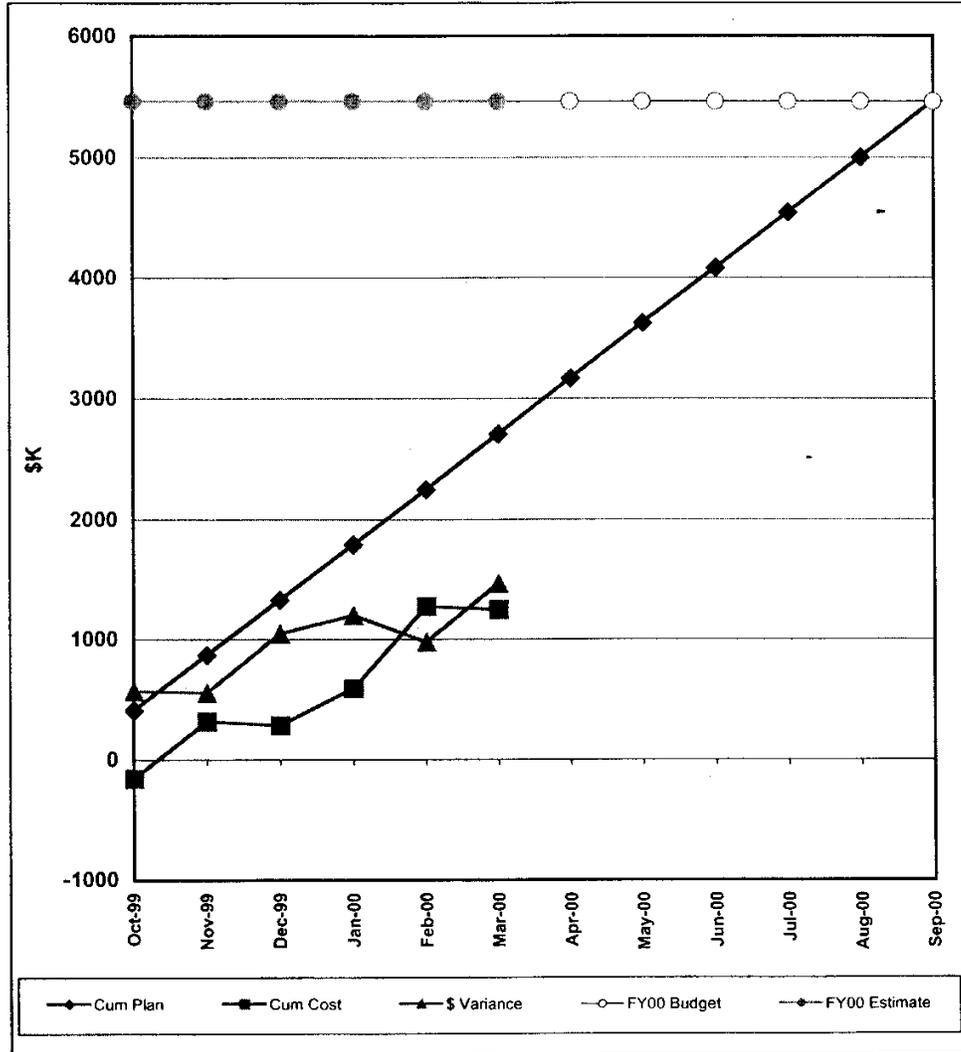
Month	Monthly		Cumulative				FY2000 Budget*	FY2000 Estimate
	Planned*	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	0	70	0	70	-70	#DIV/0!	0	0
Nov-99	0	-2	0	67	-67	#DIV/0!	0	0
Dec-99	0	3	0	70	-70	#DIV/0!	0	0
Jan-00	0	-1	0	69	-69	#DIV/0!	0	0
Feb-00	0	23	0	92	-92	#DIV/0!	0	0
Mar-00	0	33	0	125	-125	#DIV/0!	0	0
Apr-00	0		0				0	
May-00	0		0				0	
Jun-00	0		0				0	
Jul-00	0		0				0	
Aug-00	0		0				0	
Sep-00	0		0				0	

* Plan will be prepared and budgeted.

FY2000 Cost Plan to Actual
as of March 2000
WBS 1.11 (\$K)

Project Number 96-D-111
March 2000

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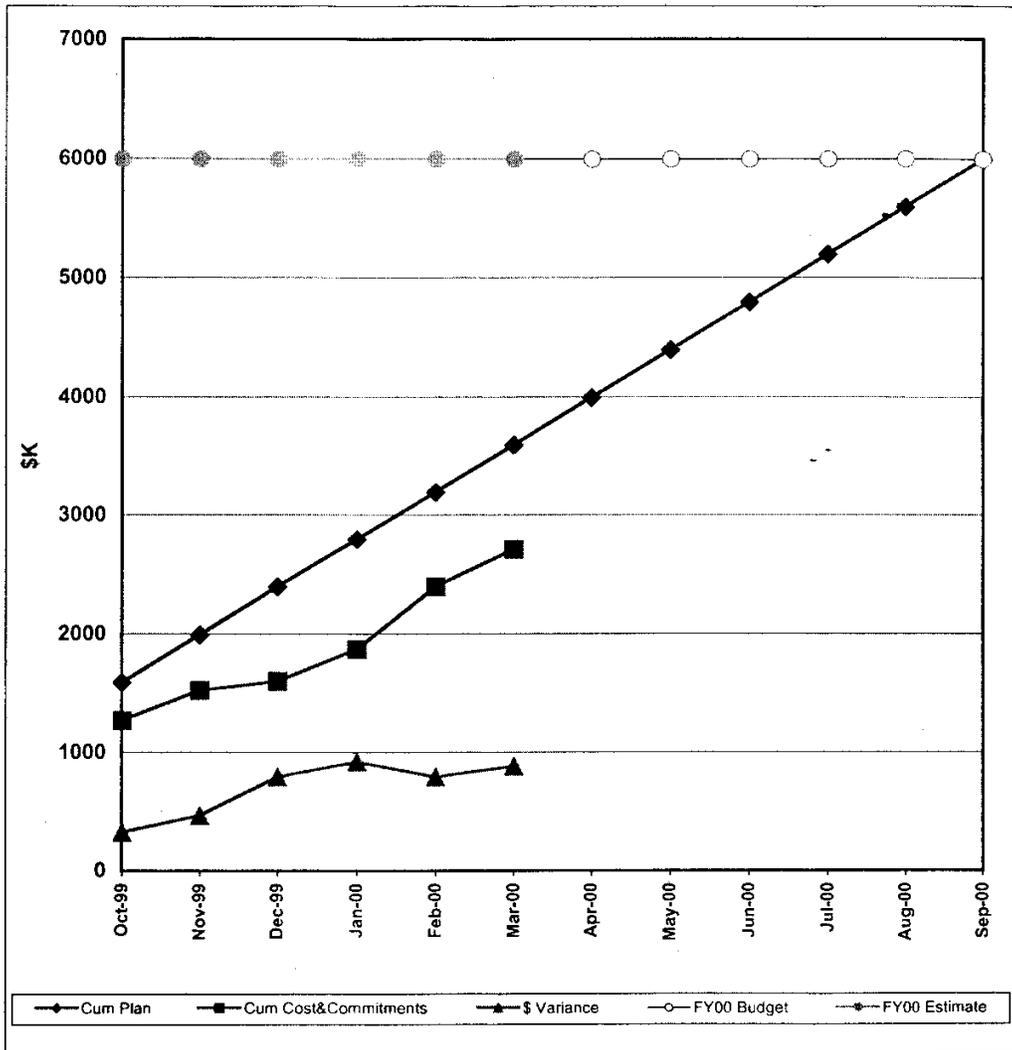


Month	Monthly		Cumulative				FY2000 Budget*	FY2000 Estimate
	Planned*	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	410	-157	410	-157	567	138%	5,466	5,466
Nov-99	460	474	870	317	553	64%	5,466	5,466
Dec-99	460	-33	1,329	284	1,046	79%	5,466	5,466
Jan-00	460	306	1,789	589	1,200	67%	5,466	5,466
Feb-00	460	682	2,248	1,272	977	43%	5,466	5,466
Mar-00	460	-29	2,708	1,243	1,465	54%	5,466	5,466
Apr-00	460		3,168				5,466	
May-00	460		3,627				5,466	
Jun-00	460		4,087				5,466	
Jul-00	460		4,546				5,466	
Aug-00	460		5,006				5,466	
Sep-00	460		5,466				5,466	

**FY2000 Cost and Commitment Plan to Actual
as of March 2000
WBS 1.11 (\$K)**

Project Number 96-D-111
March 2000

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Month	Monthly		Cumulative				FY2000 Budget	FY2000 Estimate
	Planned	Actual	Planned	Actual	\$ Var	% Var		
Oct-99	1,592	1,269	1,592	1,269	323	20%	5,993	5,993
Nov-99	400	256	1,992	1,525	467	23%	5,993	5,993
Dec-99	400	73	2,392	1,598	794	33%	5,993	5,993
Jan-00	400	271	2,792	1,869	923	33%	5,993	5,993
Feb-00	400	526	3,192	2,396	797	25%	5,993	5,993
Mar-00	400	312	3,593	2,708	885	25%	5,993	5,993
Apr-00	400		3,993				5,993	
May-00	400		4,393				5,993	
Jun-00	400		4,793				5,993	
Jul-00	400		5,193				5,993	
Aug-00	400		5,593				5,993	
Sep-00	400		5,993				5,993	

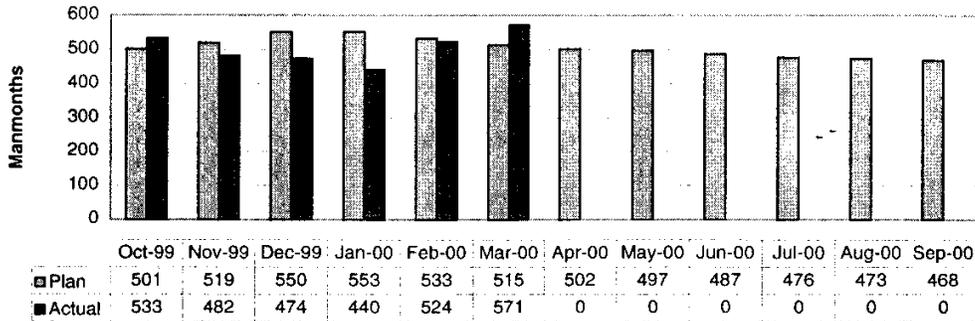
* includes \$1,423K of uncosted obligations from FY99.

2Q00 NIF Contingency Log (\$BA)

Month	Request #	WBS element	Total	Contingency
Jan-00	BCP00-004	1.1.5	\$ 362,500	\$ 23,686,988
		1.4.1.2	\$ 100,000	\$ 23,586,988
		1.5.4.1	\$ 10,000	\$ 23,576,988
		1.7.1.4	\$ 95,000	\$ 23,481,988
	BCP00-006	1.4.2.4	\$ 609,000	\$ 22,872,988
	CTR344	1.4.4.2	\$ 311,000	\$ 22,561,988
	ECR1316	1.2.2.1	\$ 20,000	\$ 22,541,988
		1.2.2.4.9	\$ 15,000	\$ 22,526,988
	ECR1356	1.4.1.3	\$ 69,300	\$ 22,457,688
	ECR1357	1.4.1.3	\$ 94,900	\$ 22,362,788
ECR1364	1.3.2	\$ 4,000	\$ 22,358,788	
Feb-00	BCP00-011	1.4.3.2	\$ 2,600,000	\$ 19,758,788
	CTR335	1.1.4	\$ 185,000	\$ 19,573,788
	CTR343	1.2.2.4.6	\$ 250,000	\$ 19,323,788
	CTR345	1.2.2.4.9	\$ 88,000	\$ 19,235,788
	CTR346	1.2.2.1	\$ 125,000	\$ 19,110,788
	CTR349	1.2.2.4.6	\$ 450,000	\$ 18,660,788
	CTR350	1.2.2.4	\$ 302,000	\$ 18,358,788
	ECR1408	1.4.4.3	\$ 50,000	\$ 18,308,788
	Mar-00	CTR351	1.2.2.4.9	\$ 145,000
CTR353		1.3.1.3	\$ 375,000	\$ 17,788,788
ECR1437		1.8.7	\$ 100,000	\$ 17,688,788
ECR1473		1.4.2.4	\$ 170,000	\$ 17,518,788
ECR1515		1.4.4.2	\$ 5,700	\$ 17,513,088
ECR1535		1.1.5	\$ 54,000	\$ 17,459,088
ECR1554		1.4.1	\$ 55,000	\$ 17,404,088
		1.6.10.1	\$ 50,000	\$ 17,354,088
	1.7.1	\$ 25,000	\$ 17,329,088	

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FY00 - Manpower Plan to Actual by Month* as of March 2000 (LLNL and Supplemental Labor Manmonths)



* FY00 manpower plan will be in draft until the rebaselining effort is complete and the FY00 Cost Account Plans are approved.